A Concise Treatise on Sumerian and Babylonian Music Theory

Richard Dumbrill
with the participation of Irving Finkel

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INTRODUCTION

This treatise is about music theory in the Ancient Near-East, a region including modern-day Levantine countries. The period covered coincides with the advent of the cuneiform script, in the late fourth millennium BC, and ends with its evanescence by the second century AD.

The evidence for the practice of music and for the type of musical instruments played is mainly iconographic and reveals musical scenes on bas-reliefs, cylinder seals, sealings and their impressions[1], statuettes and moulded plaques, painted or etched decorations on pots, bowls and other artefacts[2] which have been discovered in all parts of the Near-East.

Additionally, there are remains of musical instruments, most of which excavated by Sir Leonard Woolley in the 1920s at the site of Ur, in southern Iraq. These include lyres, harps, pipes, rattles and clappers[3].

The evidence for the theory of music has survived by chance and not by design[4], under the form of a handful of cuneiform tablets, most of them fragmentary, and of different periods and locations. Some of them were found *in situ* and others acquired from more or less reputable dealers, at the end of the nineteenth and early twentieth centuries. However, these acquisitions can be roughly dated on the basis of our knowledge of orthographic, grammatical and stylistic variations in the course of the development of the script. On the other hand, cuneiform tablets found in archaeological contexts are dated accurately. These texts give very precise and exact information on a remarkably high level.

The outcome in the present treatise demonstrates that the evidence from these sources presents a cogent and harmonious picture in which the evolution of musical theory over the best part of three millennia can be traced. It places Babylonian musical theory firmly in its right place in the history of music generally. Furthermore, it allows a proper understanding of the single known and earliest example of music ever written, about 3500 years ago.

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1 Collon, D., *7000 Years of Seals*, British Museum Press, 1997; *Catalogue of the Western Asiatic Seals in the British Museum: Cylinder Seals* Bk.5; British Museum Press, 2012; *First Impressions: Cylinder Seals in the Ancient Near East*, British Museum Press, 1993; *Catalogue of the Western Asiatic Seals in the British Museum* (Volume 4)*: Cylinder Seals*, British Museum Press, 2016.

2 Rashid, S.A., *Musikgeschichte in Bildern: Musik des Altertums - Mesopotamien*, 1984. Out of print. Publications of the iconography are abundant. For a comprehensive bibliography, see Dumbrill, R., *The Archaeomusicology of the Ancient Near East*, Trafford, 2005.

3 Woolley, C.L., *Ur Excavations, The Royal Cemetery*, Vols. I and II. *A report on the Predynastic and Sargonid graves excavated between 1926 and 1931*. Published for the Trustees of the Two Museums by the aid of a grant from the Carnegie Corporation of New York, 1934.

4 This distinction is crucially important as it would be deceitful to promote a 'universal' theory on the basis of an isolated manuscript.

Another particularly important source of information comes from an impressive quantity of hymns, laments, prayers, etc., which were sung at the temple or elsewhere, *a cappella* or to the accompaniment of specific instruments, which in most cases cannot be identified. While there are bilingual tablets with large numbers of them, all but one includes a graphic description[5]. Furthermore, their names changed in the course of history: what would have been a string-instrument at the end of the fourth millennium became a percussion, or another type of instrument, a thousand years later[6].

The extent to which music theory ruled over all types of music played in the Ancient Near-East during the course of about three millennia, is uncertain. However, there are concepts which have survived under the form of *ajnas*[7] on which the *Maqam* and other forms of Oriental music rest. It is on the basis of this apparent continuity that we may assume that a four thousand year-old theory is still practiced, might it be with some differences mainly brought up with the emergence of new instruments, trends, influences, etc. Other styles, popular or others, would have been played alongside 'classical forms', although probably in different settings, as they are today.

The texts

This treatise will only discuss tablets that are essential to the understanding of Sumerian-Babylonian music theory. These texts are presented in the order in which they best elucidate each other. They are 1 - *nabnītu* xxxii, (U. 3011); 2 - CBS 10996; 3 - UET VII, 74 (U. 7/80), left and right columns; 4 - N 4782; YBC 11381; 5 - CBS 1766; 6 - H6 (RŠ 13.30 +15.49 + 17.387).

History

Since its onset in the nineteen-sixties, the study of the music theory from the Ancient Near-East has been assiduously researched; but it was deceivingly so. It was analysed *only* from a Western perspective - as had all previous analyses of ethnic music, in unashamed Occidental Supremacism. Furthermore, it is absurd to analyse a system with posteriorly conceived theories. Ancient Near-Eastern musicology should have been laid on a blank epistemological slate on which, progressively, as news texts appeared, fragments of theory would agglutinate as pieces of a jig-saw puzzle, and eventually assemble into a theory. It was not.

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5 The *kalû* ritual text has instructions for the replacement of the head of the LILIS = *lilissu*, of which we know it was a kettle-drum since the instrument is drawn on one of the tablets. See F. Thureau-Dangin, *Rituels Accadiens* (Paris, 1921).

6 We contend that the confusion in instrument taxonomy comes from taxonomy itself. They would have considered a drum and a lyre as instruments of the same family since their basic structure consists of a drum the head of which being, in a first instance, excited by the beating of hands or sticks, and in the second instance, excited by the vibration of strings transmitted by means of a bridge. And so, in the course of time a harp came to be called a drum and some time later, a drum came to be called a lyre. To this day, we have the French 'tambour', a drum, and a Turkish Tanbur, a long-necked lute, both stemming, we contend, from Sumerian BAN.TUR, with BAN meaning 'bow' and TUR meaning 'small'.

7 That the term '*jins*' derives from the Greek γένος, does not mean that the concept was Greek. When Babylon fell to the Greeks, all knowledge was transmitted in the Greek language and an older Babylonian term would have been replaced by Greek. Thus Babylonian 'xxx' became Greek 'γένος' which was later Arabised as '*jins*'. The plural of *jins* (جنس, is أجناس), *ajnās*. A *jins* is a set of three, four, or five pitches in a stepwise melodic interval used to build an Arabic *maqam*.

Notice

Previous publications of these texts are excluded from this treatise for the reason that while they may have their own merit, they are irrelevant to the present work.

All along this treatise we will use the traditional British notation, a-b-c-d, etc. These are only illustrative conventions and must not be taken as equating to the Babylonian pitch system. Additionally, the terms 'pentads' and 'triads', etc., will replace 'fifths' and 'thirds', etc., in Babylonian contexts, and when appropriate, to avoid confusions with later systems for which we shall retain the terms 'fifths' and 'thirds', etc. The term 'enneachord' indicates a series of nine melodic diatonic intervals.

Richard Dumbrill
July 2018

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SIG$_7$ ALAM = *nabnītu* xxxii
(U. 3011, UET VII, 126. Lines 1-10)
Nomenclature and underlying pitch quantification of the nine strings of a lyre

Sir Leonard Woolley (1880-1960) found the tablet at Ur in Southern Mesopotamia, south of the main courtyard of the *Dublamaḫ* temple, in the late twenties[1]. The tablet is Neo-Babylonian, about 800 BC. However, the knowledge it includes is certainly much older as it describes an archetypal lyre[2] fitted with nine strings. Such instruments with large numbers of strings were common in the iconography around 3200 to 2600 BC. Yet, they had all but disappeared by the time this text was written, suggesting that the terminology and its underlying theory, had survived and was still taught about two millennia after its original conceptualisation.

The name of the series, *nabnītu,* written [**SIG$_7$**] **ALAM** = *nab-ni-tum,* means progeny[3]. This text is the thirty-second tablet of the series. Copies would have been distributed widely, during a number of centuries, in the various kingdoms and provinces of Mesopotamia, as it was certainly a type of encyclopedia essential to scholarly institutions, temples and palaces.

Some essential philological remarks are essential before discussing the musicological significance of this bilingual, Sumerian and Akkadian, text.

1) The Akkadian is partly but not entirely a literal translation of the Sumerian.

2) We assume that the Sumerian entries are not analytical but are the names and locations of each of the nine strings.

3) There may be a tonal interrelationship between lines 1 and 5.

4) Lines 9 to 5 seem to stand in symmetry with lines 5 to 1.

5) We take *qud-mu-um*, in line 1, as the adjective *qudmû*, meaning 'front', following the explicit writing *qud-mu-ú* in CBS 10996, rather that the noun *qudmu, '*front'.

6) Similarly, we take *šá-mu-šu-um* to stand for the adjective *šamušû*, 'adjacent', understanding Sumerian **sa-uš** as **sa-ús**, the underlying Akkadian verb being *emēdu.*

7) Therefore, we take *úḫ-ru-um* in line 9 as the adjective *uḫrû*, rather that the noun *uḫru*, 'rear' as found in lines 6 to 8.

1 Woolley, C.L., *Ur Excavations*, Volumes I and II. *The Royal Cemetery, a report on the Predynastic and Sargonic Graves Excavated between 1926 and 1931.* Published for the trustees of the two museums (British Museum and the University Museum of the University of Philadelphia, Pennsylvania).

2 We assume that it is the strings of a lyre which are described and that this instrument was paradigmatic since most of the theoretical texts up to the late first millennium BC infer an enneachordal instrument, or mention an enneatonic system.

3 *Chicago Assyrian Dictionary* (*CAD*), vol. 'n', p. 27.

Transliteration and literal translation of the Sumerian and Akkadian entries

Column i

Sumerian	Translation	Akkadian	Translation
1 **sa-di**	string **DI**	*qud-mu-⌜um⌝*	front(?) (string)
2 **sa-ús**	string adjacent	*šá-mu-šu-um*	adjacent (string)
3 **sa-3-sa-sig**	string 3 string thin	*šá-al-šu qa-a*[*t-nu*]	third (string) thin
4 **sa-4-tur**	string 4 small	**A**-[**DÙ**]	Ea-*banû* Ea-the creator
5 **sa-di-*5**	string **DI** 5	*ḫa-am-*[*šu*]	fifth (string)
6 **sa-4-a-ga-gul**	string 4 rear	*ri-bi úḫ-ri-i*[*m*]	fourth of the rear (string)
7 **sa-3-a-ga-gul**	string 3 rear	*šal-ši úḫ-ri-im*	third of the rear (string)
8 **⌜sa-2-a-ga⌝ -gul**	string 2 rear	*ši-ni úḫ-ri-im*	second of the rear (string)
9 **[sa-1] ⌜a⌝ -ga-gul-la**	string 1 rear	*úḫ-ru-um*	rear (string)
10 **[9] ⌜sa⌝ -a**	9 strings	9 *pi-it-nu*	9 strings

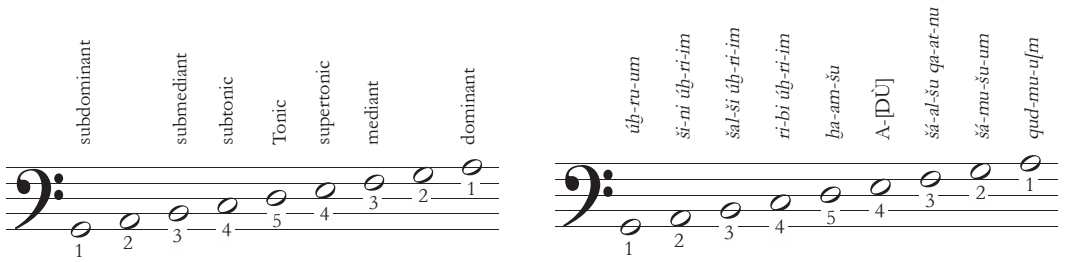
The first question that strikes the reader of this text is why the first two strings in Sumerian and Akkadian are not simply called 'string 1' and 'string 2,' what is the meaning of 'small', 'thin' and 'Ea-the creator', and why the first line has **sa.di** without '1' while the fifth line has **sa.di** with, we think '**5**', although Gurney sees '**4**' . What is the meaning of **sa.di**?. These writings cannot encapsulate some extraordinary or unintelligible system of pitches but can be explained musicologically. As we will see, the third and fourth strings give a clear indication of the transition from anhemitonism to hemitonism[4]. What is more, the nine-string (bipentadic-enneatonic) system enshrined in Nabnitu xxxii reappears in later arrangement of pitch subsets.

Is enneatonism atypical?

There is analogy between Nabnitu xxxii and a traditional Western nomenclature where the first pitch is called the 'tonic' followed by the 'supertonic', the 'mediant', the 'subdominant', the 'dominant', the 'subtonic', the 'leading' and the octaval 'tonic'. But it is highly significant that similarly to the system in Nabnitu xxxii, *the tonic was initially the central pitch of the scheme*. Supertonic and subtonic pitches were placed one step above and one step below the tonic; mediant and submediant pitches were each a third above and below the tonic; dominant and subdominant pitches were a fifth above and below the tonic[5]. This arrangement was therefore bipentadic-enneatonic, similarly to Nabnitu xxxii, as shown below where both arrangements are compared:

4 Hemitonic scales have one or more semitones, while anhemitonic scales have none.

5 Hermann von Helmholtz, *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, (1954), p. 242; Benward & Saker (2003), *Music: In Theory and Practice*, Vol. I, p.28; Jonas, Oswald, (1982), *Introduction to the Theory of Heinrich Schenker,* (1934: *Das Wesen des musikalischen Kunstwerks: Eine Einführung in Die Lehre Heinrich Schenkers*), p.22. Trans. John Rothgeb. https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Degree_(music).html



The second front and second rear pitches in this 'tonic-centric' Western system have no names for them. Later, when the tonic was displaced and became the first pitch of the series, the first fifth included the tonic, supertonic, mediant, subdominant and dominant while the second fifth shrank into a fourth to suit heptatonism: tonic, subtonic, leading and octaval tonic. The second member of the German scale is also a fourth. However, this fourth includes g, a, **b**, **h** and c, where b is a♯ and h is b. This system 'symbolically' preserves the bipentadic ennead, within the heptachord.

The history of music shows unequivocal evidence of bipentadic-enneatonism as a system of nine pitches *and not only as an instrument fitted with nine strings*. String and sound are bound. Each string has its predilected frequency. It depends on its length, its mass and on its optimal tension. A string sounding its best when tuned to its optimal frequency will not sound as well if tuned to a pitch distant by more than a semitone, higher or lower, in frequency. This principle was known from around 1800 BC, with textual evidence of strings which, in the metabolic process, were not tuned to more than a semitonal neighbouring pitch (U.7/80, right column).

In a notoriously difficult passage in Republic (545c-546d)[6], Plato writes that the Muses have two harmonies consisting of two Pythagorean heptachords superimposed in such a way that their combination aggregates into an enneachord with pitch quantifications probably derived from the system in Nabnitu xxxii, since figures in both texts mostly agree with each other (fig.3).

Boethius, in true Platonic dedication, wrote[7] that Prophastus added a string on one side to make the enneachord: 1 - hyperhypate, 2 - hypate, 3 - parhypate, 4 - lichanos, 5 - mese, 6 - paramese, 7 - trite, 8 - paranete, 9 - nete; and adds a graphic (fig.1).

6 Comford, F.M., *Plato's cosmology: The Timaeus of Plato*, Hackett, (London, 1997). Comford omits the description of Socrates' 'Sovereign Number'. Waterfield, R., *Plato: Republic* (translation, introduction, notes), Oxford University Press, 1993 (World's Classics, 1994; Book of the Month Club, February 1994), notes 'scholars nowadays largely ignore the passage'.

7 Boethius, Anicus Manlius Severinus, *De Institutione Musica, liber I*, sourced from the *Patrologia cursus completus*, series latina, ed. J.P. Migne, 221 vols. (Paris: Garnier 1844-1904), 63:1185. '*Prophrastus autem periotes ad graviorem partem unam addidit chordam, ut faceret totum enneachordum.*'

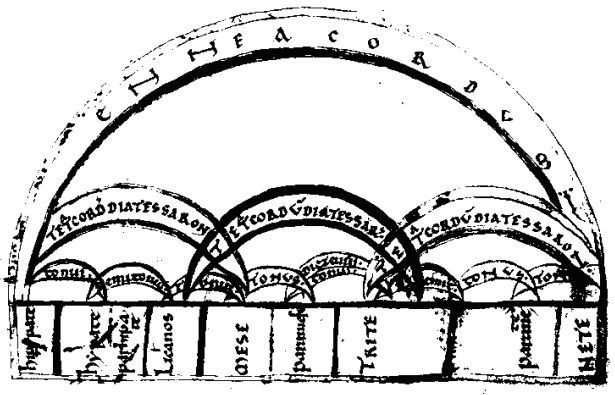


Figure 1. From Boethius, *De Institutione Musica, liber I.*

The Jesuit polymath Athanasius Kircher (1602-1680), eternizes the enneatonic concept of his *Enneachord of Nature* in the hermetic principle of analogies transposed as an instrument on which each of the nine strings sounds through all the layers of existence[8].

The most recent evidence of bipentadic enneatonism comes from the Lebanese Archimandrite Antoine Hebby in his *Petite Méthode de Musique Ecclésiastique Byzantine*, (1987) (fig.2) where he writes that Byzantine music has two scales, *the first, enneatonic and made up of two conjoined diatonic pentachords*, and the second, octatonic, composed of two disjoined diatonic tetrachords[9].

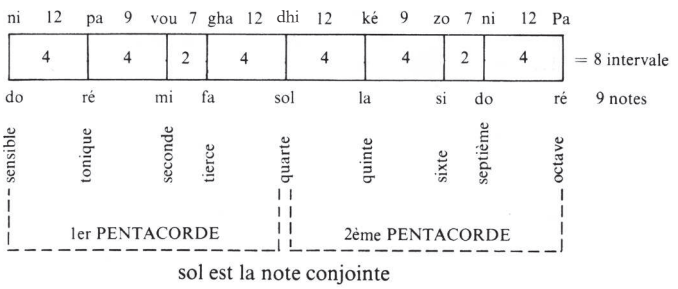


Figure 2. From Hebby, *Petite Méthode de Musique Ecclésiastique Byzantine*

Therefore, the scheme in Nabnitu xxxii is certainly not an atypical arrangement. Sumerian, Akkadian, Greek, Latin, Byzantine and Western enneatonic systems are compared in figure 3. Note that the Byzantine 'mese' is not at the centre of the system, as would be expected.

8 Heninger, S. K., *The Cosmographical Glass: Renaissance Diagrams of the Universe*, (1977): For example, under God in the *mundus archetypus*, we have nine orders of angels; under *coelum empireum*, we have the sphere of fixed stars and the seven planetary spheres (each indicated by a symbol and by the note it plays in the music of the spheres), with earth making up the ninth item in the enneachord and 'playing the lowest note among the elements. (terra cum elementis proslambanomenos). Godwin, J., *Music, mysticism and magic: a sourcebook*, (1987), p. 160: Nature thus arranges the various enneachords in the world so that all are in tune with the celestial enneachord; and when one is set going, all the rest will resonate. Fletcher, J.E., Athanasius *Kircher und seine Beziehungen zum gelerhten Europa seiner Zeit*, (1988), p.18: As the notes attributed to them go together, so the things themselves make harmonious or inharmonious 'chords', and as one sounds a certain note in one enneachord, all the other entities tuned to that note or its octave vibrate sympathetically. Boults, E.A., *Landscape of Chance*, (1994), p.14.

9 The illustration is lifted from Hebby's book printed by IMP. St. Paul, Jounieh, Lebanon, 1987, p. 24.

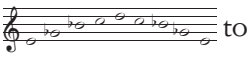
Source	A	G	F	E	D	C	B	A	G
Sumerian	sa-di	sa-uš	sa 3-sa-sig	sa 4-tur	sa-di-*5	sa 4 a-ga-gul	sa 3 a-ga-gul	sa 2 a-ga-gul	sa 1 a-ga-gul-la
Akkadian	*qud-mu-um*	*šá-mu-šu-um*	*šá-al-šu qa-at-nu*	A-DÙ	*ḫa-am-šu*	*ri-bi úḫ-ri-im*	*šal-ši úḫ-ri-im*	*ši-ni úḫ-ri-im*	*úḫ-ru-um*
Plato	Clio	Euterpe	Thaieia	Melpomene	Terpsichore	Erato	Polynymnia	Urania	Calliope
Boethius	hyperhypate	hypate	parhypate	lichanos	mese	paramese	trite	paranete	nete
Byzantine	ni (c)	pa (d)	vou (e)	gha (f)	dhi (g)	ké (a)	zo (b)	ni (c)	pa (d)
Western	subdominant		submediant	subtonic	tonic	supertonic	mediant		dominant
German	c/(a)	d/(b)	e/(h)	f/(c)	g/(d)	a/(e)	b/(f)	h/(g)	c/(a)

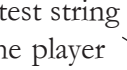
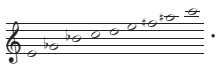
Figure 3. Table of comparison of enneatonic systems

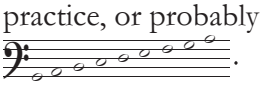
Origins of enneatonism

It is probable that the ascending/descending pattern in Nabnitu xxxii found its sources in pre-literate fifth/fourth millennium symmetrical anhemitonism, and although there is neither contemporary textual nor iconographic evidence for this construction, there is a stone relief representing a musical scene where two blind-folded musicians play the same monumental lyre, one at each end of the instrument. However, this relief comes from Ancient Egypt, and is a comparatively recent representation from around 1350 BC[10].

The advantage of this particular arrangement is that it allows for improvisations with two musicians, without any dissonance, or what we think constitutes dissonance. This is probably why anhemitonism has survived throughout the millennia and is still practiced today alongside other systems.

The structural pattern is: tone/ditone/tone/tone, or 1/2/1/1. In the ascending/descending arrangement, it becomes (1/2/1/**(1)**/1/2/1) = (e-g♭-b♭-c-**(d)**-c-b♭-g♭-e),  to keep 'd' at the centre of the system.

This arrangement is typical with earliest lyres, pre 2600 BC, were the strings are set in a 'fan' pattern with the shortest string in the middle  . Then around 2600 BC, there is a shift of the strings towards the player . This means that from ascending/descending symmetrical anhemitonism, the system became linear symmetrical anhemitonic. Thus, the symmetry is conserved with intervals between pitches set in a linear arrangement: (e-g♭-b♭-c-**(d)**-c-e-f♯-a♯-c)  .

Then, a possible conjunction of the natural approportionating of string lengths; the discovery of regular numbers; the need for smaller intervals in theory and practice, or probably a combination of these factors, led to the advent of a form of diatonism.  .

[10] From a block in a temple to the Aten at Karnak, XVIII[th] Dynasty. Manniche, L., *Music and Musicians in Ancient Egypt*, (British Museum Press, 1991), p. 91-2, pls. 54 and 55.

Metrology

While it is doubtful that Babylonian theoreticians ever measured 'popular' pitch sets - firstly for the reason that an analytical/metrological method would have been beyond their reach[11], conceptually, and secondly that they would have found this music unworthy of quantification - they would certainly have quantified a 'learned' tonal pitch system that they calculated from the comparative location of the string-pitches listed in Nabnitu xxxii, as we shall explain later in this chapter.

Furthermore, the quantifications calculated from the present text happen to match figures known from tables of regular numbers which Hiprecht discovered in 1906 at the Temple library of Nippur[12]. They date to about 2200 BC[13], over 1000 years before Nabnitu xxxii was written.

Besides music, this arithmetical series also applied to other sciences and arts such as mathematics, geometry, astrology, architecture, etc., and as a consequence, theoreticians probably 'bent' some of the popular pitch series into submission to their learned tonal system, at least in environments which they controled, such as the temple, the court or music schools. This is how a relationship between numbers and music eventually developed. For instance if a fifth, with its first pitch measuring 810, and the second 530 (= 810/530 = 81/53) = 733 cents, they would have 'bent' 530 to 540, to render the fifth just (702 cents). This is how arithmetics subjugated modality into tonality[14]. This doctrine spread to ratios of architecture following the same principle.

11 They could not for the reason that the pitches of popular music were 'instable' and therefore not 'scientifically' quantifiable from a rational construction.

12 Hilprecht, H.V., *The Babylonian Expedition of the University of Philadelphia – Series A: Cuneiform Texts*, (Hilprecht, ed.) Volume XX, Part I, Published by the Department of Archaeology, University of Pennsylvania, (1906); Hilprecht, H.V., *The Babylonian...*, Pls 10; 11; 12; 14; CBM 11340 + 11402; 11368; 11902; 11097.

13 Although at that time they were unaware that the Nippur regular numbers matched exactly the natural harmonics of a fundamental pitch, a concept only known much later, in the 19th century of our Common Era.

14 Here, the terms 'modality' and 'tonality' are taken in their earliest meaning which evolved with time to include other concepts.

The method

The realisation of quantifications which follow come from our observation of the postion of the string-pitches in Nabnitu xxxii, assuming that they progressed in linear diatonicity. Two ratios were required:

1) The Just fifth having a string length ratio of 2/3. Its reciprocal, or ratio of frequency is 3/2.

2) The Just fourth having a string length ratio of 3/4. Its reciprocal, or ratio of frequency is 4/3.

These ratios can be converted in musical cents[15]:

2/3 = 702 cents;
3/4 = 498 cents;

The series in Nabnitu xxxii, 1-2-3-4-5-4-3-2-1, represents a symmetrical/palindromic order in a linear disposition. If numbers 1-5 equal a Just fifth, and 1-4, a Just fourth, then:

1) Take 5 as starting, or tonal pitch.

2) Project two Just fifths from the tonal centre. This defines the bipentadic-enneatonic ambitus: (3/2 + 3/2 = 9/4).

3) From the boundaries of the span, project two Just fourths, inwardly.

4) From the tonal centre, project two Just fourths.

5) From the third strings project Just fourths in opposite directions.

This construction generates the following series of intervals, in ratios of frequency:
9/8; 10/9; 27/25; 10/9; 9/8; 16/15; 9/8; 10/9 (fig. 4).

9/8	= 9/8	= 204 cents
9/8 + 10/9	= 5/4	= 386 cents
5/4 + 27/25	= 27/20	= 520 cents
27/20 + 10/9	= 3/2	= 702 cents
3/2 + 9/8	= 27/16	= 906 cents
27/16 + 16/15	= 9/5	= 1018 cents
9/5 + 9/8	= 81/40	= 1222 cents
81/40 + 10/9	= 9/4	= 1404 cents

or 9/8+10/9+27/25+10/9+9/8+16/15+9/8+10/9 = 9/4 = 1404 cents

Although Babylonians were highly skilled with ratios, there is no evidence that they used them for music theory. Therefore, we shall use musical cents (which we derived from our hypothetical ratios of comparative string location) and their equation with the Nippur regular numbers, i.e. 9/8 (ratio) = 81/72 (Nippur) = 204 (cents).

15 A cent is the logarithmic division of the 12-tone equal temperament semitone into 100 equal parts. The formula for calculating the cents-value of any ratio is: cents = log10r * [1200 / log102] or cents = log2r * 1200, where 'r' is the ratio.

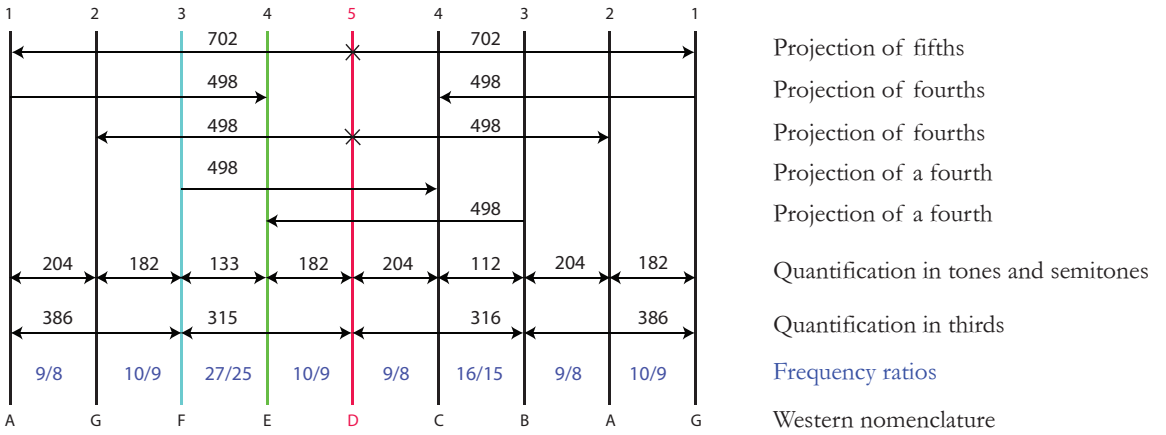


Figure 4. Quantification of the enneachord in *nabnītu* xxxii

The Nippur numbers run from 81 to 1. However, those of interest to us, in relation to the enneatonism in Nabnitu xxxii, are in the range of 81 to 36:

They are regular[16]-number harmonics of a single fundamental frequency.

However, our quantification of the pitches calculated from the alternation of Just fifths and Just fourths in Nabnitu xxxii gives the following, with 64.8 replacing 64, and omits 80:

81, [80], 72, (64.8), [64], 60, 54, 48, 45, 40, 36,

(or 810, [800], 720, 648, [640], 600, 540, 480, 450, 400 and 360 (x 10 to avoid 64.8))

The ratios between them are:

810/720	=	9/8
720/648	=	10/9
648/600	=	27/25
600/540	=	10/9
540/480	=	9/8
480/450	=	16/15
450/400	=	9/8
400/360	=	10/9

16 Regular numbers evenly divide powers of 60. They are numbers the only prime divisors of which being 2, 3, and 5.

Axis

Front Rear

String number	1		2	3	4	5	4	3	2	1
Nippur	810	800	720	640	600	540	480	450	400	360
Nabnitu	810		720	648	600	540	480	450	400	360

The Nabnitu xxxii 'rear' figures (5-1) coincide with the Nippur numbers (360; 400; 450; 480 and 540). However, the 'front'-strings (1-5) exclude 800.

The reason is that two pentads (3/2 x 3/2) = 9/4 = 810/360 = 1404 cents.

The ratio between 810 and 540 is a Just fifth = 702 cents.

720/540 = is a Just fourth = 498 cents.

648/540 = 6/5 = 316 cents, a Just minor third.

640/540 = 294 cents is a Pythagorean minor third.

The difference between 316 and 294 is a syntonic comma which is 21.5 cents:

(6/5 - 64/54 = 81/80 = 21.5).

There is another discrepancy with the third front string. While Nabnitu xxxii has 648, Nippur gives 640. 648/640 = 81/80, the syntonic comma of 21.5 cents. The differences between 810/800 and 648/640 are the same and are the consequence of the presence of two systems: 810-648 for pentadic-enneatonism and 800-640 for forthcoming heptatonism, about eight hundred years later. Therefore, the ingeniosity of the Nippur regular numbers is that they address to anhemitonism, pentadic-enneatonism and heptatonism within the spectrum of natural harmonic quantification.

The 'front'-string differences of quantification with their 'rear'-string counterparts are reflected with some of the terms with which they are qualified. This explains the terminological ambiguity with which theoreticians attempted at formulating precise terms, such as 'front'-string instead of 'first' string, for example, where 'first' and 'front' have different meanings, probably illustrated by the hesitation between regular numbers 810 and 800. Proleptically, 800 introduced a 'shared'[17] octave in relation to 400 and as a consequence reduced 648 to 640,

The differences between the Nippur and the Nabnitu xxxii figures are no larger than the syntonic comma of 21.5 cents, or about 1/8th of a tone.

The deviation of number 648 in Nabnitu xxxii, from 640 in the Nippur text, is the consequence of the inclusion of a semitone into the system. In order to include this semitone, the interval of a fourth needed to be projected from the 'third string of the rear' to the 'fourth string of the front'; and another from the 'third string of the front' to the 'fourth string of the rear'. This led to the creation of a dissonant interval as we shall see later (U.7/80). Furthermore, this text also gives the reason for calling the 'string 4 small[18]', 'Ea-the-creator[19]', as it 'creates' consonance by

17 I write 'shared' because this octave has its first pitch placed in one pentad and its last in its conjoined pentad. Therefore this is not an octave as musicology should understand it. An octave should be located within one independant pitch construction. Pentads are not large enough to accommodate the octave.

18 According to the Sumerian column. This attests that in the original Sumerian Period the dissonance was not emendated.

19 According to the Akkadian column, which attests of the emendation, proof that the emendation of the dissonance

correcting 648 to 600, by 'immaculation' of the dissonance.

The whole of the Babylonian metabolic system rests on the correction of the dissonant interval in each pitch subset in order to generate the next subset, and so on until reaching the concluding subset.

The Nippur numbers can be interpreted either as ratios of string lengths or as ratios of frequencies since the former are inversely proportional to the latter. Even if Babylonian theoreticians did not understand the concept of frequency, they could have calculated and felt it, centuries before it was eventually understood, at the end of the nineteenth century, by Herz, Helmholtz and others probably. They would have noticed, by the sense of touch, that when a bass string was played, its vibrations were slower than the vibrations of a string with a higher pitch. They would certainly have associated this phenomenon with pitch quantification. The higher the pitch number, the faster the vibration of the string, and inversely.

This first text in our research has shown that:

1) The system described is linear diatonic bipentadic-enneatonic.
2) It initially consisted of two symmetrical anhemitonic ascending/descending sets.
3) Around 2600 BC, the system became linear diatonic bipentadic-enneatonic.
4) With the introduction of the semitone, the first descending fifth had two pitches which differed from their counterpart in the second descending fifth. Thus the system was no longer strictly symmetrical. This is reflected in the terminology.
5) The pitches of the system correspond to the regular numbers between 810 to 360 which were known from mathematical tables found in the Temple Library of Nippur.
6) The pitches, as they stand in the text, would be the quantification of the Babylonian generative set. This means that it is from this original construction, the method of which having been described above, that other series of pitches, or subsets, were derived, as we shall see in the analysis of other texts in this work.
7) Line 10 confirms the usage of a lyre fitted with nine strings and an underlying enneatonic diatonic generative system.

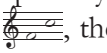
appeared in the Akkadian Period.

CBS 10996
Nippur, Neo-Babylonian (ca. 600 BC)
(A compression to heptatonism of a tridecachord, with interval nomenclature)

Introduction to melodic and harmonic intervals and of their polarity
in the context of Babylonian theory

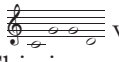
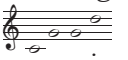
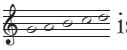
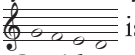
Musical intervals are of two kinds. They can be melodic, or harmonic.

When the two pitches of an interval are played one after the other, or consecutively, they constitute a melodic interval. The order in which their pitches are played is called their polarity.

For instance, in an ascending octatonic system (i.e. c-d-e-f-g-a-b-c') if we have f-c'  , the polarity is ascending. f is played before c', and therefore f is at a lower pitch than c'. If the interval is c'-f , the polarity is descending. The name of pitches can be substituted with numbers, in which case, c = 1, and e = 3, for example, and numbers can be substituted or equate to other qualifications, for instance 1 can be called 'first string/pitch', 'neighbouring pitch', 'Ea-creator'-string, etc.

If the system is descending, (i.e. c'-b-a-g-f-e-d-c), c'-a = 1-3 has a descending polarity. When intervals have both polarities in the same text, this can only mean that they are melodic as there would be no other reason for both polarities to appear in the same document without meaning melodicity.

When the two pitches of an interval are played together, or simultaneously , they constitute a harmonic interval. In a system of harmonic intervals in an ascending system, their naming or numbering is always of the same polarity. In ascending polarity, the lowest pitch is always written first (and the contrary in a descending system). A series of harmonic intervals within an ascending octaval series is, for example 1-2 ; 1-3 ; 1-4 ; 1-5 ; 1-6 ; 1-7 and 1-8 , always with the lowest number written first (and the contrary in a descending system).

The inversion of polarity can be the consequence of the compression of a system which forces the inversion, for instance when an enneatonic system is compressed into a heptachord. Changes of polarity also indicates intervallic inversion. In the case of a heptatonic ascending series, 1-5/5-2 would indicate c-g/g-d  when in fact 5-2 is the inversion of 5-9,  in a system larger than heptatonic. This inversion does not change anything to the harmonic quality as 9 and 2 are of the same pitch class. However, this would disagree completely with Near-Eastern theory where intervals are melodic and therefore, 5-2 and 5-9 are systemically different: 5-9 = g-a-b-c-d,  is a melodic ascending fifth, while 5-2 = g-f-e-d,  is a melodic descending fourth. This is the principal difference between Oriental and Occidental music theory. Western musicology understands intervals as empty melodic or harmonic structures while the Orient understands them as filled melodic structures including all the pitches within the intervals. This explains why Babylonian intervals had names to distinguish them from others, without having to locate them by numbers, as is the case with the *ajnas* of the Oriental Maqam.

Babylonian theoreticians did not perceive pitches in terms of height. In the nomenclature of Nabnitu xxxii there are a 'front' string and a 'rear' string instead of an expected 'bass' and 'treble' strings. Should pitch height had been conceptualised, their notation of harmonic intervals might have been written vertically, as in our Western figured bass, and we might have had $\frac{5}{1}$ instead of 1 5 to indicate a harmonic fifth. Therefore we can conclude that their linearity was horizontal and not vertical.

Hand copy and reconstruction of CBS 10996

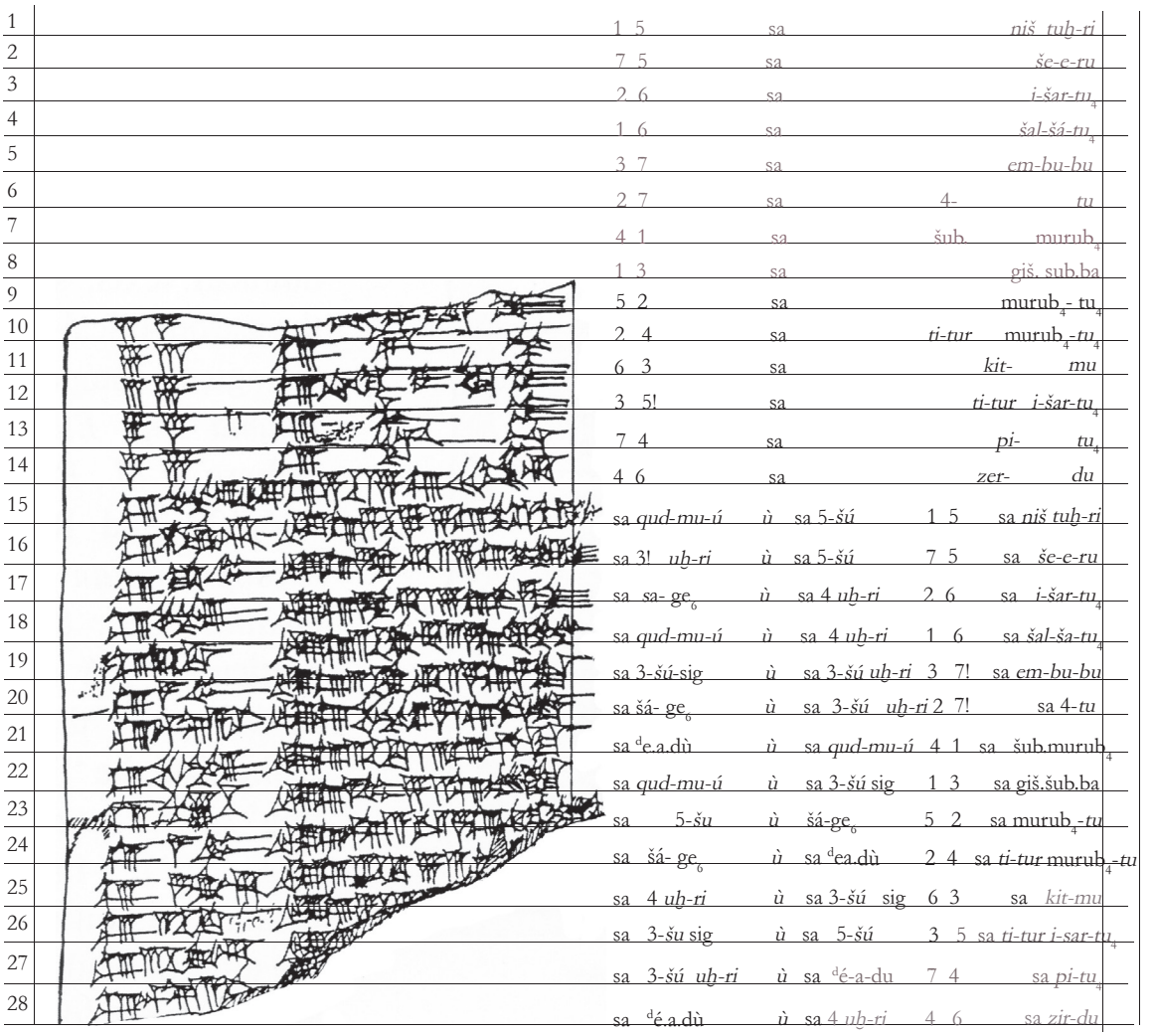

1 5 sa niš tuḫ-ri
7 5 sa še-e-ru
2 6 sa i-šar-tu4
1 6 sa šal-šá-tu4
3 7 sa em-bu-bu
2 7 sa 4- tu
4 1 sa šub. murub4
1 3 sa giš. sub.ba
5 2 sa murub4- tu4
2 4 sa ti-tur murub4-tu4
6 3 sa kit- mu
3 5! sa ti-tur i-šar-tu4
7 4 sa pi- tu4
4 6 sa zer- du
sa qud-mu-ú ù sa 5-šú 1 5 sa niš tuḫ-ri
sa 3! uḫ-ri ù sa 5-šú 7 5 sa še-e-ru
sa sa- ge6 ù sa 4 uḫ-ri 2 6 sa i-šar-tu4
sa qud-mu-ú ù sa 4 uḫ-ri 1 6 sa šal-ša-tu4
sa 3-šú-sig ù sa 3-šú uḫ-ri 3 7! sa em-bu-bu
sa šá- ge6 ù sa 3-šú uḫ-ri 2 7! sa 4-tu
sa dé.a.dù ù sa qud-mu-ú 4 1 sa šub.murub4
sa qud-mu-ú ù sa 3-šú sig 1 3 sa giš.šub.ba
sa 5-šu ù šá-ge6 5 2 sa murub4-tu
sa šá- ge6 ù sa dea.dù 2 4 sa ti-tur murub4-tu
sa 4 uḫ-ri ù sa 3-šú sig 6 3 sa kit-mu
sa 3-šu sig ù sa 5-šú 3 5 sa ti-tur i-sar-tu4
sa 3-šú uḫ-ri ù sa dé-a-du 7 4 sa pi-tu4
sa dé.a.dù ù sa 4 uḫ-ri 4 6 sa zir-du

Figure 5. Hand-copy after F. al-Rawi. Transliteration by J. Friberg.

We shall first analyse the numbers.

1) They are limited to seven.
2) The first nine lines have been extrapolated from extant lines 10 to 28.
3) The numbers are arranged in pairs in each line.
4) The first 14 lines have the same paired numbers as the last 14 (lines 15 to 28).

Because the intervals (paired numbers) have both ascending and descending polarities in the same context, they cannot be harmonic. It is therefore proven, *de facto*, that they are melodic.

The pattern:

1) Lines 1, 2 and 3 (and 15, 16 and 17) present a coherent pattern of an alternation of descending melodic pentads (fifths) and ascending melodic triads (thirds[1]).

2) The pattern is interrupted at lines 4 and 18 because it is restricted to seven steps.

3) A regular and uninterrupted alternation of descending pentads and ascending triads results in a span of thirteen (tridecachord) steps which is the original ambitus, prior to its compression into the heptachord in CBS 10996.

Below is a comparative graphic of both the pattern in CBS 10996 and what it would have been, originally (fig. 6).

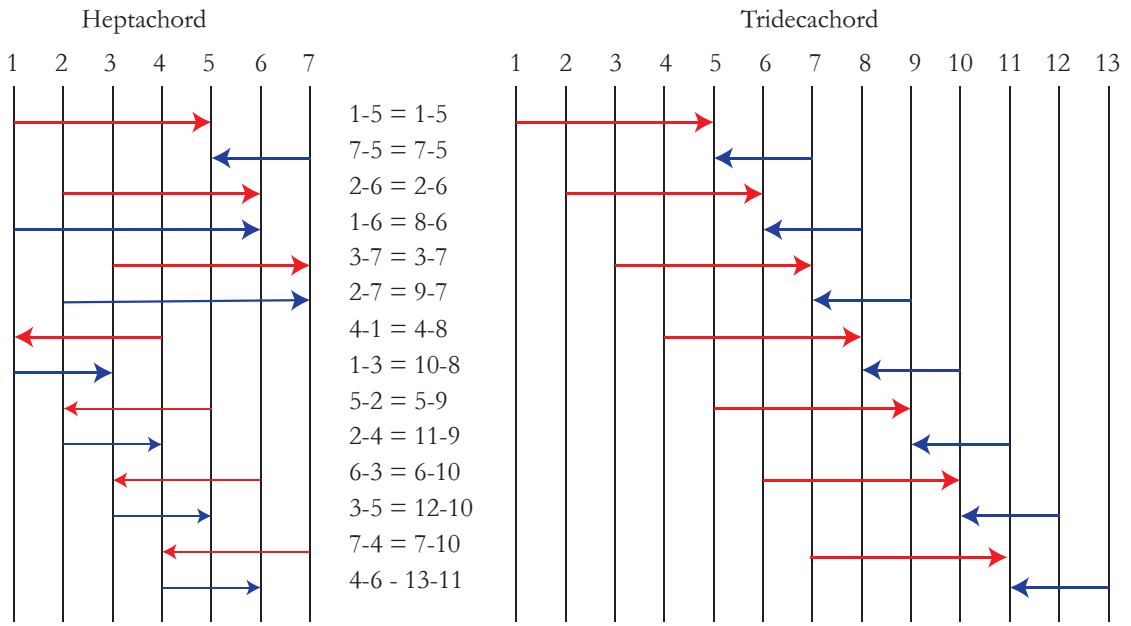


Figure 6.

Melodic intervals have two distinct functions: they may be empty and used in tuning systems or they may be filled, or stepwise, in which case they are the building blocks of larger subsets.

1 We know that the system was descending as will be proven with text U 7/80.

As they stand, in the present text, it is impossible to give exact tonal values to any of the intervals in CBS 10996 as the text does not provide with any clues for such conclusions. We assume that the intervals 1-5; 2-6; 3-7 may be Just fifths. The values for thirds are even less possible to determine as there are no indications to say if they were major (how major), minor (how minor) or neutral (how neutral). All we know is that each fifth and each third have different names the meaning of which having been lost with time. It is from these names, that Ancient Near-Eastern musicians knew how these intervals sounded, without rescourse to any notation. In *maqām* teaching, it is the name of the *jins* which reminds the musician of the sructure of the interval and not numbers.

The illustration below shows the organisation of these melodic intervals with their names (fig. 7).

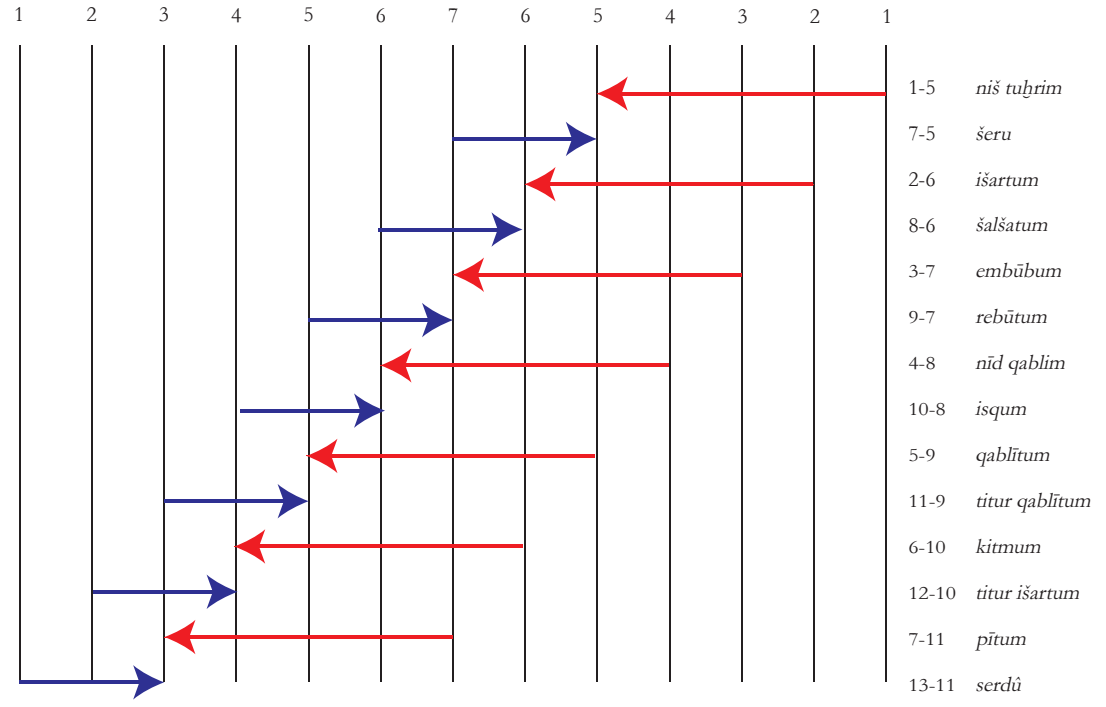


Figure 7

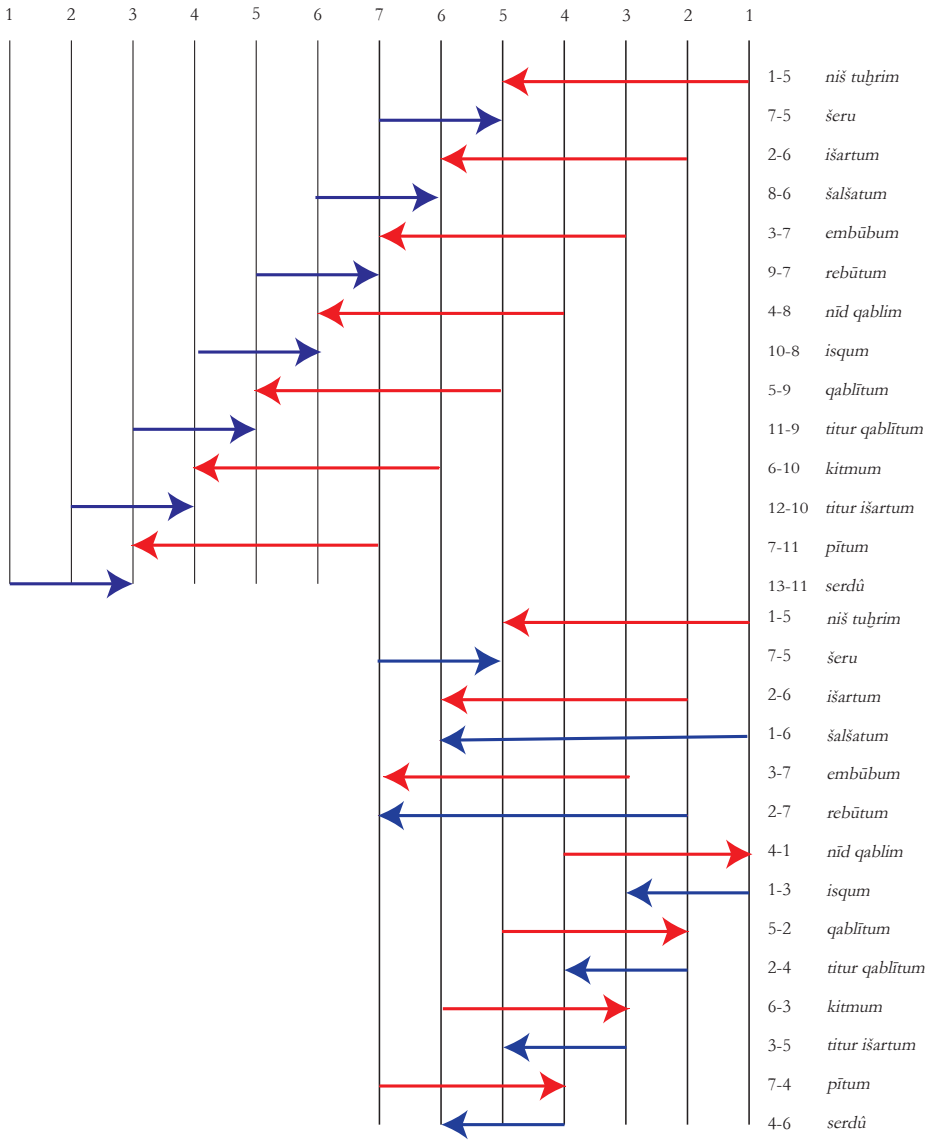


Figure 8. Comparative analytical graphic locating the descending interpretation of CBS 10996 (bottom right column), in relation to the author's extrapolated restitution of the original ambitus (above). This show that CBS 10996 was a compression of the original span into a heptatonic framework by means of intervallic inversion.

Most of the meaning of the names of melodic pentads remains obscure, as previously mentioned. However, the term *qablītum* is unequivocal. It means 'part of the middle' and sits right in the middle of the system in our reconstruction.

CBS 10996 is neither a list of harmonic intervals, nor it is a tuning method for the reason that it gives no instructions and that no generative system can be tuned from the intervals in the order in which they are given, or in any other order. We believe that this text was an exercise for the transposition of intervals, which were originally spread in a larger span, into a smaller heptachord. Let us remember that this text was found by chance and therefore, it would be absurd on this basis, that somehow, it would be the infallible proof that the whole theory of the Ancient Near-East, during three thousand years, was heptatonic, and that it was made up of harmonic intervals, especially that almost all other texts which have survived clearly are enneatonic.

Figure 9 superimposes our tonal quantification of text *nabnītu* xxxii on top of our reconstruction of CBS 10996. It shows perfect coherence between them as they share a central axis of symmetry, both having the interval *qablītum* in their centre.

However, *nabnītu* xxxii has a smaller span. It is an enneatonic sub-system within a tridecatonic greater system where both superimpose, symmetrically. On the other hand, the position of CBS 10996 is excentric as it occupies only the first half of the tridecade as shown in figure 8.

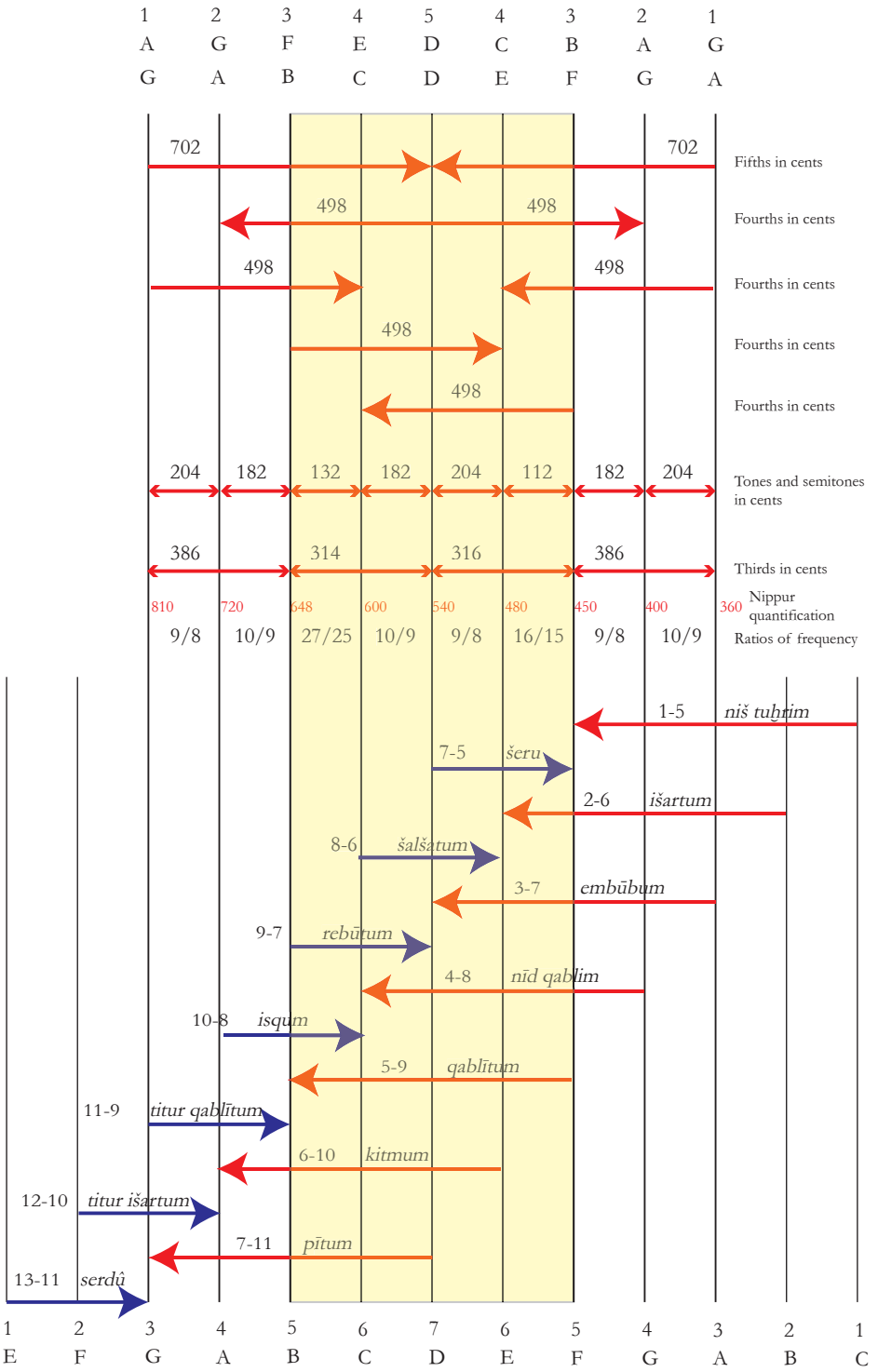
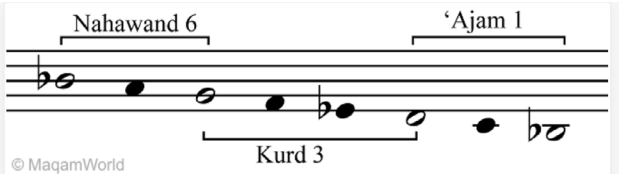


Figure 6. Superimposition of Nabnitu xxxii on the reconstruction of tridecadic CBS 10996. The section shaded yellow locates the tritonic? interval *qablītum* meaning 'part of the middle'.

Philology

While Nabnitu xxxii lists the names of string-pitches, in their generative status, CBS 10996 lists the names of stepwise melodic fifths and thirds. Melodic stepwise fifths are the building blocks of the system described in text U. 7/80. Melodic stepwise triads are conjoined, into melodic stepwise fifths.

The meaning of the names of melodic intervals has eroded with time. However the paralel with the Maqamian system with its *ajnās* is evident. The Babylonian enneatonic subsets, similarly to the Maqamian subsets are also built from melodic intervals and also take the name of their intervals. For instance one of the *maqām ajam* is made up of:



Maqam 'Ajam 'Ushayran is an archaic version of *Maqam 'Ajam* with a different *sayr*, and has a completely different tonal emphasis as well. Rather than tonicizing its fifth degree, it tonicizes its third and sixth degrees instead.

During the Islamic period, and probably in the centuries before, the Babylonian system metabolised into the Maqamian structure, adding melodic, triads, tetrads and pentads, and building up with them a much more important number of subsets. Their names are the equivalent of the Babylonian subsets. There is certainly a structural similarity between Babylonian and Maqamian subsets, as for instance, *maqām ajam* is close to the subset of *išartum.*

The earliest mention of the term *maqām* (Arabic: مقام, transliterated 'maqām', literally 'place'; plural مقامات 'maqāmāt') occurs in fourteenth century treatises of al-Sheikh al-Safadi and Abdulqadir al-Maraghi. Melodic intervals are called *jins* جنس , pl. أجناس, *ajnās*) from Greek genos, (γένος).

Outside of the temple, folkloric, and other popular melodies existed long before theory was even conceptualised. Musicians had not even thought about giving names to melodies, to their scales, modes, rhythms, etc. It was titles, or incipits, or short descriptions, which reminded them of a mood, of a style, of a structure, just as certain signs, or their vocalisation, can trigger a multitude of sensations; or a tune reminisce emotions arising from an event which happened while it had been played, in the past. Each syllable has a psychogenetic power which acts as a stimulus triggering emotion. With time, the incipit of melodies became abbreviated, often to one term.

Numbers provided structure and terms suggested emotion. Hence the blurred relationship which stands between the inanimate[2] rigour of tonality (learned music) and modal animation (popular music). The terms, or verbal qualifiers, complements of pitche series, became the modal phoneme (the sound-image) or the *signifier*, of the tonal structure, (the concept) or the

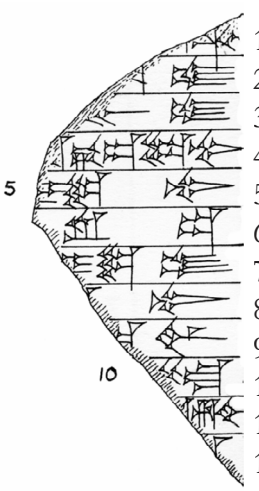
2 I use 'inanimate' and 'animate' in their Latin meaning: 'anima', the soul, and the Latin translation of Greek 'psyche'.

signified [3].

Music is about diverging from the inflexibility of numbers. A composer does not think in 'equal temperament'. But it is during the process of transcription onto paper, regardless of what happened in their minds while composing, that their work becomes 'equally-tempered' because the modern Western system does not allow for anything else. The difference between what happens in our mind and its transcription equates to what cannot be transcribed, and what can, i.e., the modal and the tonal.

3 Ferdinand de Saussure, *Course in General Linguistics*: 'I propose to retain the word *sign* [*signe*] to designate the whole and to replace *concept* and *sound-image* respectively by *signified* [*signifié*] and *signifier* [*signifiant*]'. *Course in General Linguistics*, edited by Charles Bally and Albert Sechehehaye in collaboration with Albert Reidlinger. Translated from the French by Wade Baskin. Philosophical Library, New York, (1959), p. 67.

U. 7/80 (UET VII 74) 1800 BC. (Left column)
(Taxonomy?)



1. [. . . . . *ú*]*ḫ*?-*ri*?-*im*
2. [. . . . .]-*tum*
3. [. . . . . *re-b*]*u-tum*
4. [. . . . . *ni-i*]*d*? *qà-ab-li-tim*
5. [. . . . .]*i-šar-tim*
6. [*úḫ*] - *ru* - *um*
7. [. . . . .] *i-šar-tum*
8. [. . . . .]-*tim*
9. [. . . . . *ṣ*/*zer-d*]*i-im*
10 .[. . . . . *ki-it-m*]*u-um*
11 .[. . . . . *u*]*ḫ-ri-im*
12 .[. . . . .].

Figure 28, U. 7/80, Gurney's hand copy and transliteration of the left column.

This tablet dates from the Old-Babylonian period, about 1800 BC. It was unearthed by Sir Leonard Woolley at Ur[1]. It has two columns. We shall analyse the left column first.

In order to avoid confusions, we shall take string/pitch numbers, intervals and subsets as they appear in the Generative System reconstructed from CBS 10996.

In the left column of U. 7/80, lines 1, 6 and 11 must refer to three rear strings (4, 3 and 2) because the noun *uḫru* is in the genitive and that only in these three strings *uḫru* can be in the construct state: *ri-bi úḫ-ri-im*; *šal-ši úḫ-ri-im* or *ši-ni úḫ-ri-im*: fourth-string 'of the rear'; third-string 'of the rear'; second-string 'of the rear'.

At line 6, we take *úḫ-ru-um* as the adjective *uḫrû*, rather that the noun *uḫru*, 'rear'.

The other terms refer to interval names known from CBS 10996. Line 2 has the nominative (*t*)-*um*, and could be either *išartum*, *šalšatum*, *rebūtum* or *qablītum*, with intervals 2-6, 8-6, 9-7 and 5-9 respectively. Line 3 ending with *b*]*u-tum* could only belong to *rebūtum* 9-7. Line 4, *qà-ab-li-tim* in the genitive implies that it is preceded by *titur* meaning 'bridge'. The intervals could either be 4-8, or 11-9. In line 5 *išartim* could be preceded by *titur* since it is in the genitive, interval 12-10. Line 7 has *išartum* in the nominative, interval 2-6. Line 8 ending with a genitive could either be titur *qablītim* or *titur išartim*, 11-9 or 12-10. The next line, 9 with *-d*]*i-im* could either be 1-5, 4-8 or 11-9. Line 10 with its nominative ending is most likely to be 6-9.

1 Woolley, C.L., *Ur Excavations*, Volumes I and II, (opere citato).

5
10
1. [. . . . . ú]ḫ-ri-im
2. [. . . . qà-ab-l]i-tum
3. [. . . re-b]u-tum
4. [. . . ti-tu-u]r qà-ab-li-tim
5. [. . . .]i-šar-tim
6. [úḫ]-ru-um ?
7. [. . .]i-šar-tum
8. [. . . šal-š]a-tim
9. [. . . ṣ/zer-d]i-im
10 .[. . . ki-it-m]u-um
11.[. . . ri-bi ú]ḫ-ri-im
12 .[. . . . .]m

string	5?	= D?
interval	5-9	b-c-d-e-f
interval	11-9	g-a-b
interval	9-7	b-c-d
interval	2-6	e-f-g-a-b
string	1 of rear	= G
interval	2-6	e-f-g-a-b
interval	8-6	c-d-e
interval	6-4	e f g
interval	6-10	a-b-c-d-e
string	4 of rear	= C
interval	6-10	

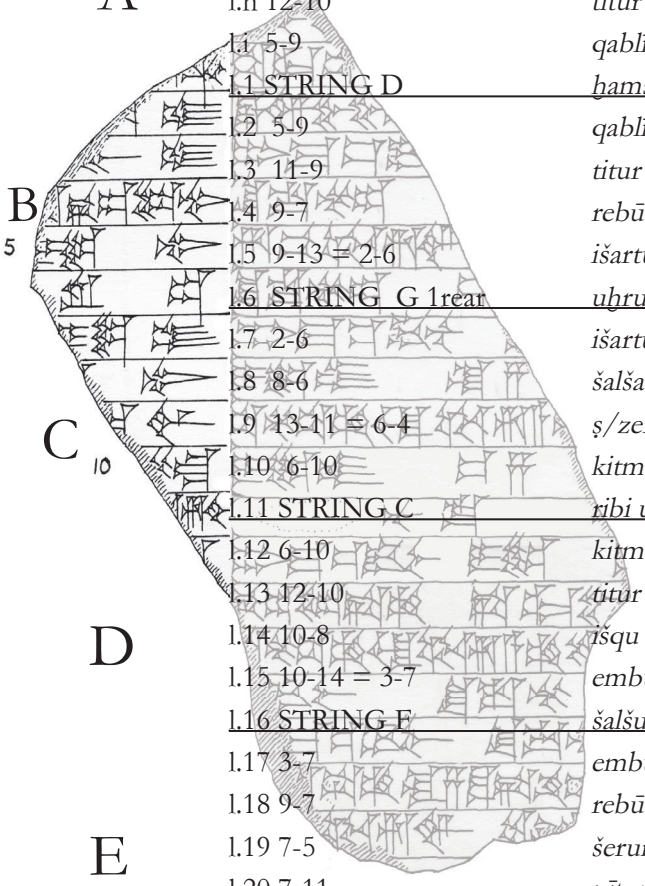
Figure 29, U.7/80, interpretation of string and interval positions.

Leaving aside the philological problems raised by the abobe reconstruction and relying only on musicological logic, we note that the text is made up of quatrains, as is the case with the right column of the same tablet. However, on this column, quatrains are subtitled with pitch-string names arranged in descending fifths, according to our reconstruction.

The quatrain proceed as follows:

1) The first line is a descending melodic fifth.
2) The second line is an ascending melodic third.
3) The third line is an ascending melodic third.
4) The fourth line is a descending melodic fifth.
5) The fifth line is the name/pitch of a string.

These intervals follow a specific patterm: 1-5; 7-5; 12-10; 5-9.These represent intervals which are written in full as they are listed in the Generative System: 1-5 = *niš tuḫrim*; 7-5 = *šerum*; 12-10 = *titur išartim*; 5-9 = *qablītum*. Follows the subtitle, in this case: *ḫamšu* ? The next quatrain starts with the last interval ending the previous one. In this case: 5-9, interval *qablītum*. See figure 30 next page for full reconstruction.



l.e STRING A	*qudmu*	String A
l.f 1-5	*niš tuḫrim*	f-c-a-b-c
l.g 7-5	*šerum*	d-e-f
l.h 12-10	*titur išartim*	f-g-a
l.i 5-9	*qablītum*	b-c-d-e-f
l.1 STRING D	*ḫamšu*	String D
l.2 5-9	*qablītum*	b-c-d-e-f
l.3 11-9	*titur qablītim*	g-a-b
l.4 9-7	*rebūtum*	b-c-d
l.5 9-13 = 2-6	*išartum*	e-f-g-a-b
l.6 STRING G 1rear	*uḫrum*	String G
l.7 2-6	*išartum*	e-f-g-a-b
l.8 8-6	*šalšatum*	c-d-e
l.9 13-11 = 6-4	*ṣ/zerdum*	e-f-g
l.10 6-10	*kitmum*	a-b-c-d-e
l.11 STRING C	*ribi uḫrim*	String C
l.12 6-10	*kitmum*	a-b-c-d-e
l.13 12-10	*titur išartim*	f-g-a
l.14 10-8	*išqu*	a-b-c
l.15 10-14 = 3-7	*embūbum*	d-e-f-g-a
l.16 STRING F	*šalšu qatnu*	String F
l.17 3-7	*embūbum*	d-e-f-g-a
l.18 9-7	*rebūtum*	b-c-d
l.19 7-5	*šerum*	d-e-f
l.20 7-11	*pītum*	g-a-b-c-d
l.21 STRING B	*šalši uḫrim*	String B
l.22 7-11	*pītum*	g-a-b-c-d
l.23 13-11	*serdû*	e-f-g
l.24 11-9	*titur qablītum*	g-a-b
l.25 4-8	*nīd qablim*	c-d-e-f-g
l.26 STRING E	A-DÙ	String E
l.a 4-8	*nīd qablim*	c-d-e-f-g
l.b 10-8 = 3-1	*isqum*	a-b-c
l.c 8-6	*šalšatum*	c-d-e
l.d 8-12 = 1-5	*niš tuḫrim*	f-c-a-b-c
l.e STRING A	*qudmu*	String A

Figure 30. Reconstruction of the left column of U. 7/80 with intervals and polarities indicated by arrows.

Structural analysis of the system in the left column

As shown in figure 30, the system is made up of seven quatrains. We assume that the series started with quatrain 'A' for the reason that it starts with the interval 1-5 = *niš tuḫrim*, followed immediately by *šerum*, as we have it in CBS 10996. It is followed by titur *išartim* and *qablītum*. This generates the following pattern:

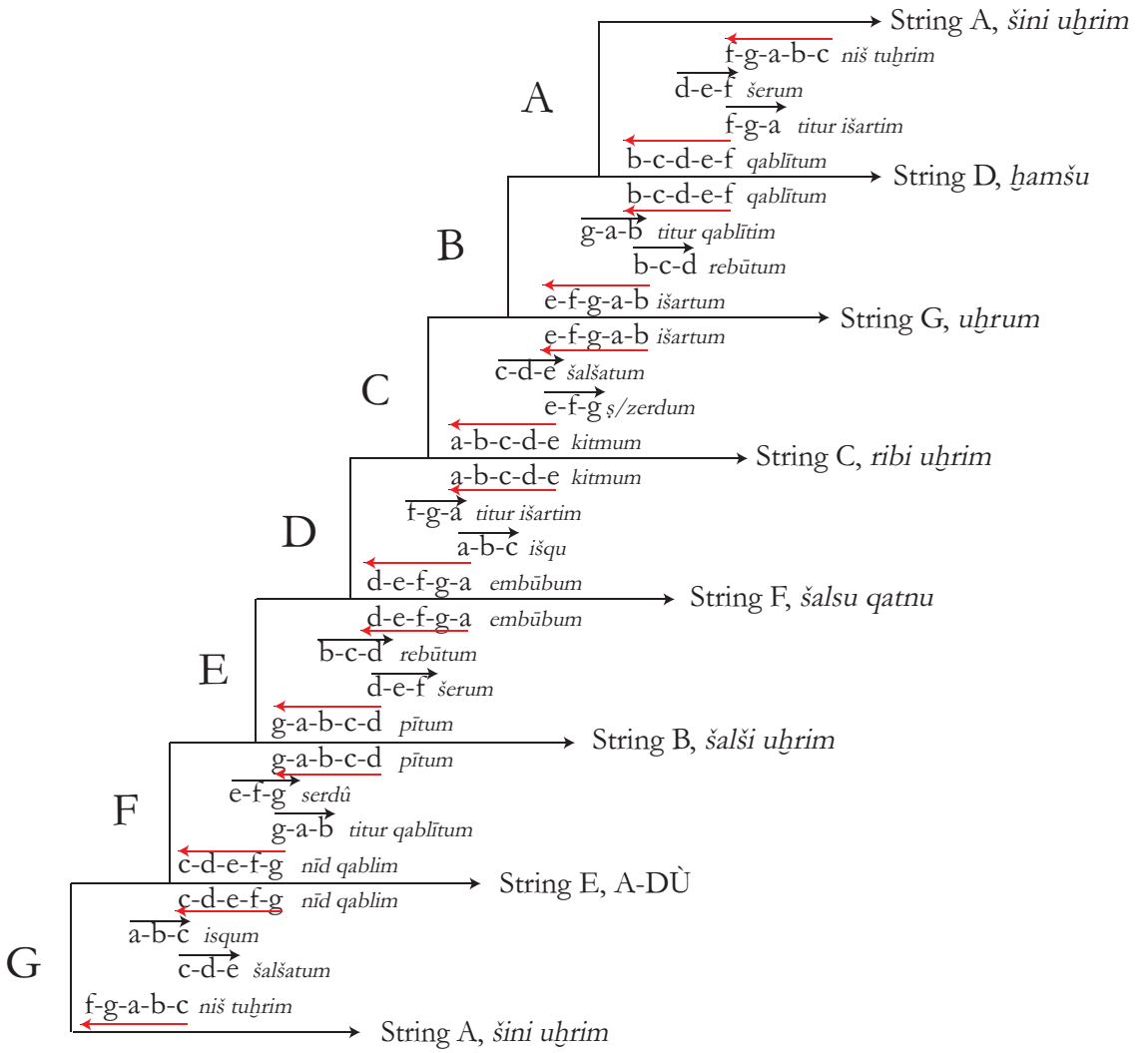


Figure 31. Reconstruction of the left column of U.7/80 with intervals values and polarities indicated by arrows.

Observation

In our reconstruction,

1) The first quatrain, 'A',

a) Starts with the descending melodic pentad *niš tuḫrim*.
b) It is complemented with the last member of the quatrain, the descending melodic pentad *qablītum*.
c) The conjoining of the two intervals amounts to the subset *išartum*.
niš tuḫrim + *qablītum* = *išartum*. (c-b-a-g-f + f-e-d-c-b = c-b-a-g-f-e-d-c-b)
d) The next qatrain starts with the descending melodic pentad *qablītum*.
e) The two inner ascending melodic intervals of the first quatrain are *šerum* and *titur išartim*.
f) When they are conjoined as a-g-f-e-d they form the melodic pentad *embūbum* which ends on 'd' which is the pitch of string *ḫamšu*.

2) The second quatrain, 'B',

a) Starts with the descending melodic pentad *qablītum*.
b) It is complemented with the last member of the quatrain, the descending melodic pentad *išartum*.
c) The conjoining of these intervals amount to the subset *qablītum*.
qablītum + *išartum* = *qablītum*. (f-e-d-c-b + b-a-g-f-e = f-e-d-c-b-a-g-f-e).
d) The next quatrain starts with the descending melodic pentad *išartum*.
e) The two inner melodic intervals of the second quatrain are *titur qablītum* and *rebūtum*.
f) When they are conjoined (d-c-b-a-g) they form the descending melodic pentad *pītum* which ends on 'g' which is the pitch of string *uḫrum*.

The next quatrains follow the same pattern. The last descending melodic pentad of the last quatrain is also the first descending melodic pentad of the first quatrain. Therefore, this system consisted of a series of seven melodic enneatonic subsets.

Analysis

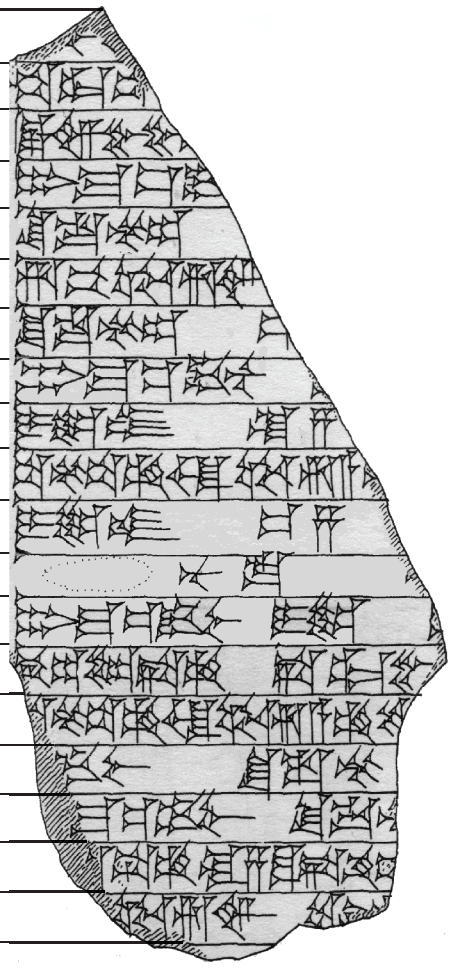
From the above observations, we can lay the following rules:

I The first and fourth descending melodic pentads of a quatrain conjoin into a subset. (This subset is also - significantly - the first one cited in the first quatrain of the right column of U. 7/80).
II The last descending melodic pentad of a quatrain is taken as the first descending melodic pentad of the quatrain which follows.
III The two inner ascending melodic triadic interval amount to a descending melodic pentad the last pitch of which being the name of the string listed after each quatrain.

Conclusion

We do not see any purpose for this series of quatrains other than they appear to be a form of classification. However, it confims that descending melodic enneads are made of conjoined descending melodic fifths. Descending melodic fifths are made of conjoined ascending melodic thirds.

U. 7/80 (UET VII 74) 1800 BC. (Right column)
(A method by which dynamic subsets are metabolised into thetic subsets)



[*šum-ma* ^{giš}**ZÀ.MÍ** *pi-i-tum-ma*]

1 [*e-e*]*m-b*[*u-bu-um la za-ku*]
2 *ša-al-š*[*a-am qa-at-na-am tu-na-sà-aḫ-ma*]
3 *e-em bu-bu-u*[*m iz-za-ku*]
4 *šum-ma* ^{giš}**Z**]**À.MÍ** *e-em-bu-bu-um-ma*]
5 *ki-it-mu-um* [*la za-ku*]
6 *re-bi úḫ-ri-im* [*tu-na-sà-aḫ-ma*]
7 *ki-it-mu-um i*[*z-za-ku*]
8 *šum-ma* ^{giš}**ZÀ.MÍ** *k*[*i-it-mu-um-ma*]
9 *i-šar-tum la za-*[*ka-at*]
10 *ša-mu-ša-am ù-úḫ-ri-a-a*[*m tu-na-sà-aḫ-ma*]
11 *i-šar-tum iz-za-*[*ku*]
12 *nu-su - ḫ*[*u-um*]
13 *šum-ma* ^{giš}**ZÀ.MÍ** *i-šar-t*[*um-ma*]
14 *qa-ab-li-ta-am ta-al-pu-*[*ut*]
15 *ša-mu-ša-am ù-úḫ-ri-a-am te-*[*ni-e-ma*]
16 [^{giš}]**ZÀ.MÍ** *ki-it-mu-*[*um*]
17 [*šum*]*-ma* ^{giš}**ZÀ.MÍ** *ki-it-m*[*u-um-ma*]
18 [*i-ša*]*r-ta-am la za-ku-ta-am t*[*a-al-pu-ut*]
19 [*re-bi*] *úḫ-ri-im te-ni-e*[*-ma*]
20 [^{giš}**ZÀ.MÍ** *e-em-bu-bu-um*]

Figure 10. Gurney's hand copy and transliteration of the right column of U.7/80 (UET VII 74).

The instructions given in the right column of this text have for purpose the reduction of the large ambitus of the Generative Babylonian System, which consists of 13 string-pitches arranged in a *dynamic* system, to a reduced enneatonic *thetic* system.

The tablet is badly damaged with its sides broken away. However, the text could be restored by means of extrapolation on the basis that line 12 appears to be the axis from which lines 13 to 16 are in symmetry with lines 8 to 11 (the only fully readable lines). Therefore, we take it that the instructions in this text are set in quatrains and exhibit a pattern similar to the left column and to

the symmetry in Nabnitu xxxii. The diagram below illustrates this analogy (fig. 11).

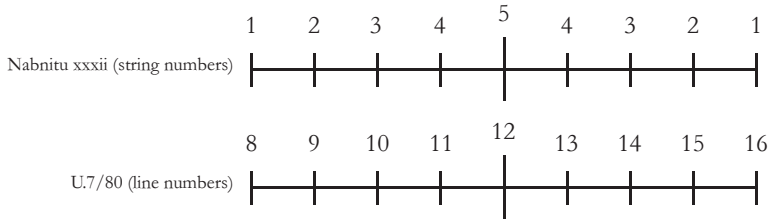


Figure 11. Systemic analogy between Nabnitu xxxii and U.7/80. Note that the numbers for the representation of U.7/80 are the line numbers of the text and not string numbers which can be substituted to the string numbers in Nabnitu xxxii.

Therefore, both systems in Nabnitu xxxii and U. 7/80 are linear descending bipentadic-enneatonic. They corroborate each other. However, and despite of the symmetric nature of the instructions given in the two quatrains sitting on each side of the axis of symmetry (line 12), it would have been impossible to say how the text started or finished. Yet, it was on the basis that the first interval (1-5) in Nabnitu xxxii is *niš tuḫrim*, and that, as we shall see later, this descending melodic pentad is the first pentad of the subset of *išartum* (the second being *qablītum*), that the likelyhood the text started with the subset of *išartum* became obvious. Thus we uphold that U. 7/80 gives instructions for a series of seven descending bipentadic-enneatonic subsets sharing the names of the seven pentads in Nabnitu xxxii. Therefore, the names of melodic pentads listed in Nabnitu xxxii were also names given to the seven bipentadic enneatonic subsets, and consequently, there must be a term which distinguished them. Since both pentads and enneads share the same names, it is evident that, initially, the subsets were pentadic, probably an inheritance from precursor pentatonic anhemitonism, and that with time, pentads conjoined in enneads as illustrated with the pattern of their string-pitches in Nabnitu xxxii.

We shall now analyse the instructions in the quatrains.

1) Each sequence is written in the form of a quatrain where the first line mentions that a **ZÀ.MÍ**-instrument is (tuned) in a given subset.
2) The second line locates a '*la zaku'* interval *by name only.*
3) The third line instructs which string(s) should be tensioned or relaxed.
4) The fourth line says that as a result of the tension or relaxation of the aforementioned string(s), the '*la zaku'* interval has been made '*iz-za-ku'*.

1') The next line mentions that the **ZÀ.MÍ**-instrument is (tuned) in the subset which has the same name of the previously corrected '*iz-za-ku*' interval (in line 4).
2') The second line locates a '*la zaku*' interval *by its name only.*
3') The third line instructs which string(s) should be tensioned or relaxed,
4') and the fourth line says that as a result of the tension or relaxation of the string(s) mentioned, the '*la zaku*' interval has been made '*iz-za-ku*'.

The process continues until in reaches line 12 where we read *nasāḫum*, Sumerian **gìd-i**, or *nussuḫum*, Sumerian **zi-zi**, which appears to be the technical verb for 'to tension (strings)'. Its antonym is *ne'ûm*, Sumerian **tu-lu**, 'to relax (strings)'. This is how we concluded that the Babylonian system was descending. At line 13 the process is reversed.

'*la zaku*', the melodic diminished pentadic interval, gives its name to the next enneatonic set which starts a new quatrain, implying a relationship between them.

Now, a particularity of diatonism is that as a consequence of its construction, it hosts a melodic pentad which does not 'sound right'. In the generative pitch set of Nabnitu xxxii, this interval sits in the middle of the series and is appropriately called *qablītum* meaning 'middle part'. The Babylonians qualified the interval as '*la zaku*' meaning 'unclear'. It would be tempting to call it a 'tritone' however, its size is atypical. '*la zaku*' equals to 648/450 = 36/25 = 632 cents, which is the Acute Diminished Fifth (for comparison purposes, 612 cents is the Pythagorean tritone, and 600 is the Equal Tritone). The '*la zaku*' interval can qualify any of the melodic pentads depending on where they are placed in the system.

There follows the application of the process both in the dynamic (black) and the thetic (red).

Part 1

Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Dynamic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= f-e-d-c-b-a-g-f-e
Thetic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= c-b-a-g-f♯-e-d-c-b
Dynamic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Thetic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= c♯-b-a-g-f♯-e-d-c♯-b
Dynamic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Thetic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= c♯-b-a-g♯-f♯-e-d-c♯-b
Dynamic fifths	*embūbum* + *pītum*	=	set of *pītum*	= a-g-f-e-d-c-b-a-g
Thetic fifths	*embūbum* + *pītum*	=	set of *pītum*	= c♯-b-a-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= d-c-b-a-g-f-e-d-c
Thetic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= g-f-e-d-c-b-a-g-f
Thetic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯

Part 2

Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Thetic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b
Dynamic fifths	*nīd qablim* + *nīš tuḫrim*	=	set of *kitmu*	= g-f-e-d-c-b-a-g-f
Thetic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= c♯-b-a♯-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*pītum* + *nīd qablim*	=	set of *embūbu*	= d-c-b-a-g-f-e-d-c
Thetic fifths	*embūbum* + *pītum*	=	set of *pītum*	= c♯-b-a-g♯-f♯-e-d♯-c♯-b
Dynamic fifths	*embūbum* + *pītum*	=	set of *pītum*	= a-g-f-e-d-c-b-a-g
Thetic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= c♯-b-a-g♯-f♯-e-d-c♯-b
Dynamic fifths	*kitmum* +*embūbum*	=	set of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Thetic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= c♯-b-a-g-f♯-e-d-c♯-b
Dynamic fifths	*išartum* + *kitmum*	=	set of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Thetic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= c-b-a-g-f♯-e-d-c-b
Dynamic fifths	*qablītum* + *išartum*	=	set of *qablītum*	= f-e-d-c-b-a-g-f-e
Thetic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b
Dynamic fifths	*nīš tuḫrim* + *qablītum*	=	set of *išartum*	= c-b-a-g-f-e-d-c-b

The '*la zaku*' pentads are located at the following positions:

In the subset *išartum*,	'*la zaku*' is placed on fifth	*qablītum*	it is placed between strings 5-1b
In the subset *qablītum*,	'*la zaku*' is placed on fifth	*nīš tuḫrim*	it is placed between strings 1f-5
In the subset *nīš tuḫrim*,	'*la zaku*' is placed on fifth	*nīd qablim*	it is placed between strings 4f-2b
In the subset *nīd qablim*,	'*la zaku*' is placed on fifth	*pītum*	it is placed between strings 3b-4f
In the subset *pītum*,	'*la zaku*' is placed on fifth	*embūbum*	it is placed between strings 3f-3b
In the subset *embūbum*,	'*la zaku*' is placed on fifth	*kitmum*	it is placed between strings 4b-3f
In the subset *kitmum*,	'*la zaku*' is placed on fifth	*išartum*	it is placed between strings 2f-4b

The thetical process, however, presents a problem. No matter how inventive it was, almost four thousand years ago, and even if it still amazes today, it is amazing only insofar as it remains a theoretical device. We cannot imagine a temple or a court musician going through the process of tuning his instrument, *in situ*, from *išartum* to *embūbum*: Firstly, he would have to tune his instrument from *išartum* to *qablītum*; then from *qablītum* to *nīš tuḫrim;* them from *nīš tuḫrim* to *nīd qablim*; then from *nīd qablim* to *pītum*, and them, at last, to *embubum*! This would have been an astonishingly cumbersome process which we believe, would have certainly impressed the theoretician elite but would have been worthless in practice. We take it that lyricists would have played only in few selected subsets and that complex transpositions would have been seldom required during a particular event.

Below is the Western notation representation of the first part of the system, both dynamic and thetic (fig. 12). The '*la zaku*' intervals are indicated in red and arrows lead to the subsets to which they give their name.

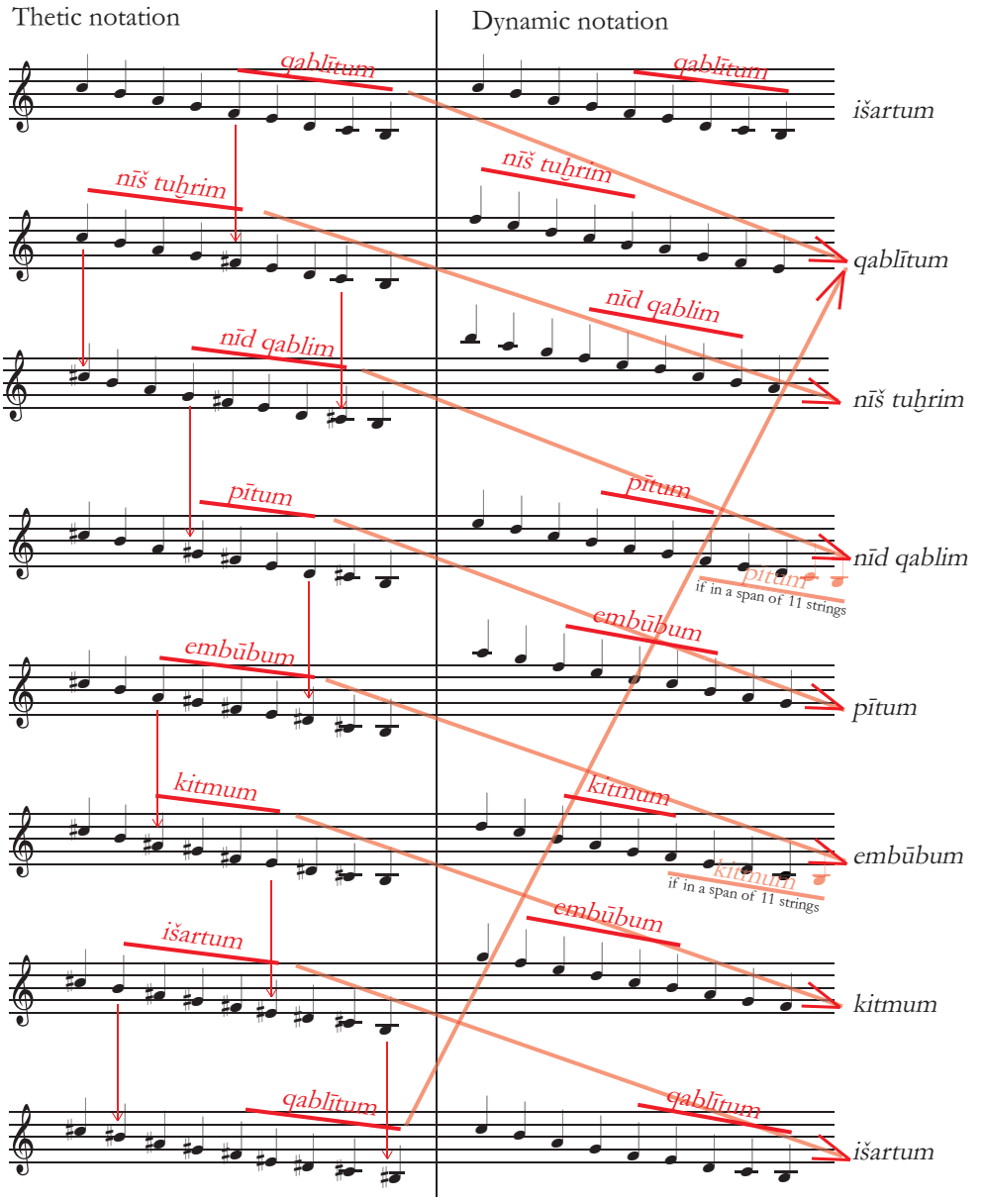


Figure 12. This illustration compares the dynamic subsets to the thetic subsets (Part 1). It shows were the '*la zaku*' intervals are placed in each subset (see fig. 13).

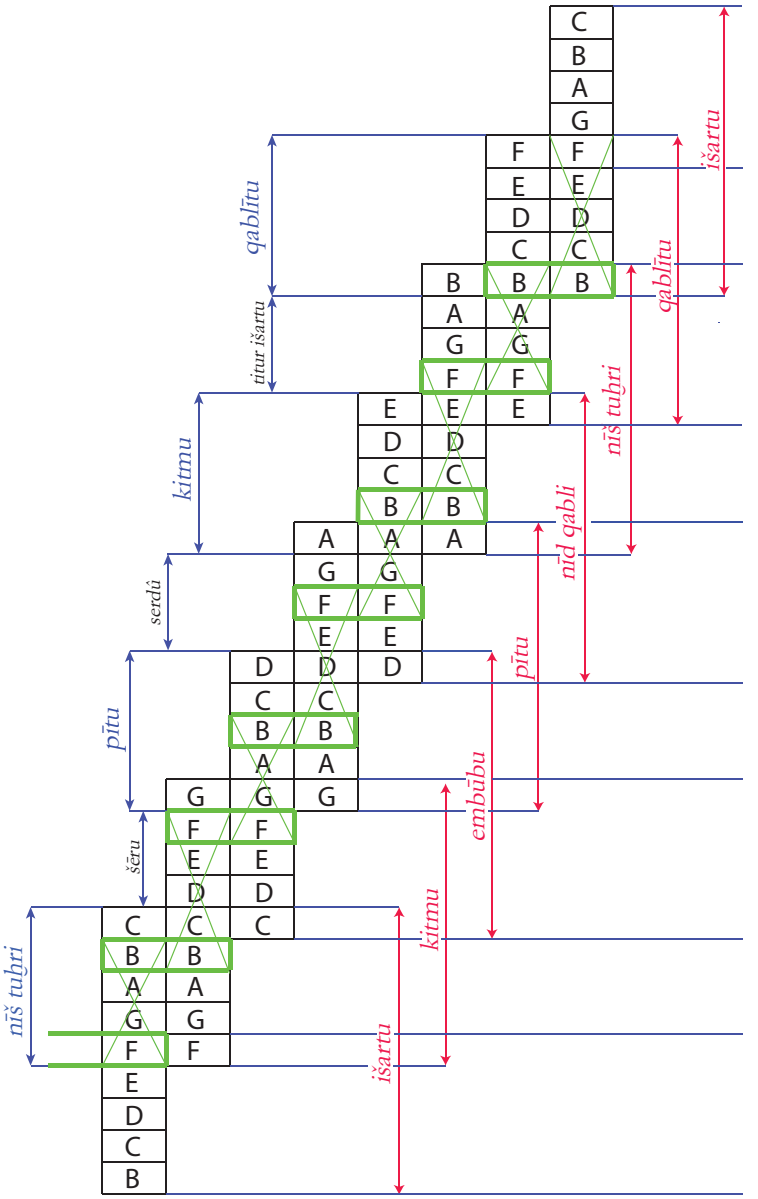


Figure 13. This diagram is the linear spatial dispersion of the Babylonian dynamic system. Red labels indicate enneatonic sets, pentads are in blue and triads in black. 'Unclear' intervals are crossed in green.

Now, it is probable that court or temple musicians were illiterate. Therefore, they would have learnt their music by oral transmission. They would have known exactly, from their unconscious, how each sounded, better than any written instruction would have. They tuned their their instrument from tonal and modal memory, exactly as Maqamian musicians do today. Thus, while we recognise the remarkable level of Babylonian scholarship, the proof of which being discussed in this treatise, we must consider that the musicians' ability to memorise all that was needed, made the theoretical recital pointless in praxis.

N 4782

(Fragment of *nabnītu* xxxii)

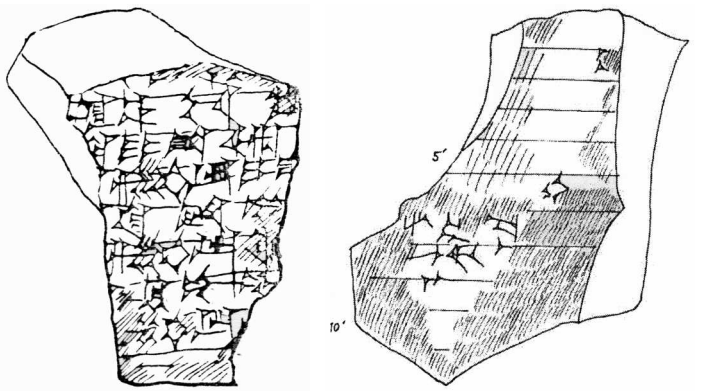


Figure 14. hand copies of N 4782, left, Rev. by Shaffer, right, Obv. by Miguel Civil

In November 1977 Aaron Shaffer found a small fragment in the University Museum collection in Philadelphia, which he believed complemented UET VII 126. It was published in 1981(fig.14).

Obverse

Line	Sumerian column	Akkadian column
1' (i8)	[x x x x]	*š[i]-n[i] ú[ḫ-re-em]*
2' (i9)	[x x x x]-la	*úḫ-ru-[um]*
3' (i12)	[x x]-sa 2	*i-ša-ar-[tum]*
4' (i13)	[x x x x x]	*sí-ḫi-ip i-š[a-ar-ti-im]*
5' (i14)	[x x x x x]	*ki-it-mu-[um]*
6' (i15)	[x x x x x]	*sí-ḫi-ip ki-i[t-mi-im]*
7' (i16)	[x x x x x]	*en-bu-bu-[um]*
8' (i17)	[x x x x x	*s]í-ḫ-ip e[n-bu-bi-im]*

Reverse

Line	Sumerian column	Akkadian column
1'- 4' broken or undeciphered traces		
5'	[x x x x	*x x x] a [xx]*
6'	[x x x x	*x x x x] ḫi-x [x]*
7'	[x x x x x	x x x x x]
8'	[x x giš al]-gar	x x[x x x]
9'	[x x x	*x]x ti-x-[x x x]*
10'	[x x x x]x	*[x x x x x]*
rest broken		

UET VII 126, Obv. Col.I & 2, N.B. + N 4782, Obv. O.B.?

1.	sa.di	*qud-mu-u*[*um*]	[sa.di	*qud-mu-u-um*]
2.	sa-uš	*šá-mu-šu-um*	[sa.uš	*šá-mu-šu-um*]
3.	sa.3.sa.sig	*ša-al-šu qa-a*[*t-nu*]	[sa.3.sa.sig	*ša-al-šu qa-at-nu*]
4.	sa.4.tur	*a-ba-nu-*[*ú*]	[sa.4.tur	*a-ba-nu-ú*]
5.	sa.di*5	*ḫa-am-*[*šu*]	[sa.di*5	*ḫa-am-šu*]
6.	sa.4.a.ga.gul	*ri-bi úḫ-ri-i*[*m*]	[sa.4.a.ga.gul	*ri-bi úḫ-ri-im*]
7.	sa.3.a.ga.gul	*šal-ši úḫ-ri-rim*	[sa.3.a.ga.gul	*šal-ši úḫ-ri-rim*]
8.	sa.2.a.ga.gul	*ši-ni úḫ-ri-im*	1’ [sa.2.a.ga.gul]	*ši-ni ú*[*ḫ-ri-im*]
9.	[sa.1]a.ga.gul.la	*úḫ-ru-um*	2’ [sa.1.]a.ga.gul].la	*úḫ-ru-um*
10.	[9]sa.a	9 *pi-it-nu*		
11.	[sa.]du.a!	*pi-is-mu*		
12.	[sa.] si.s]á	*i-šar-ti*	3’ [sa.si].sá	*i-ša-ar-*[*tum*]
13.	[sa.x si.sá]	[*s*]*i-ḫ-ip i-šar-tum*	4’ [sa.x sa.s]á	*si-ḫi-ip i-š*[*a-ar-tim*]
14.	[sa. šu?]	[*ki-i*]*t-mu*	5’ [sa.š]u?	*ki-it-mu-*[*um*]
15.	[sa.x šu?]	[*si-ḫi-ip k*]*i-it-mu*	6’ [sa.x š]ú?	*si-ḫi-ip ki-*[*it-mi-im*]
16.	[sa.gi.gíd]	[*em-bu-bu*]*-um*	7’ [sa.gi.g]íd	*em-bu-bu-*[*um*]
17.	[sa.x.gi.gíd]	[*si-ḫi-ip em-bu-bu-u*]*m*	8’ [sa.x.gi.gíd]	*si-ḫi-ip e*[*n-bu-bi-im*]
18.	[sa.x]	[*pi-tum*]	9’ [sa.x]	[*p*]*i-*[*tum*]
19.	[sa.x y]	[*siḫip pitim*]	10’ [sa.x y]	[*siḫip pitim*]
20.	[sa.šub.murub$_4$]	[*nīd qablim*]	11’ [sa.šub.murub$_4$]	[*nīd qablim*]
21.	[sa.x.šub.murub$_4$]	[*siḫip nid qablim*]	12’ [sa.x.šub.murub$_4$]	[*siḫip nīd qablim*]
22.	[sa.x.gaba.ri]	[*niš tuḫrim*]	13’ [sa.x.y.gaba.ri]	[*nīš tuḫrim*]
23.	[sa.x.y.gaba.ri]	[*siḫip niš tuḫrim*]	14’ [sa.x.y.gaba.ri]	[*siḫip nīš tuḫrim*]
24.	[sa.x.murub$_4$]	[*qablitum*]	15’ [sa.x.murub$_4$]	[*qablitum*]
25.	[sa.x.y.murub$_4$]	[*siḫip qablitum*]	16’ [sa.x.y.murub$_4$]	[*siḫip qablitim*]

N 4782 is certainly a fragment which is the continuation of *nabnītu* xxxii, from another copy of the text. It would be a second ‘chapter’, as after having listed the nine string-pitches of the system, the text continues with line 11. [**sa.**]**du.a**! (Sumerian) *pi-is-mu* (Akkadian), as a header. But what is the meaning of *pismu*? The *CAD* is inconclusive as it says nothing more than we already know. An enlightened guess, on the basis of our interpretation of lines 12 (= 3’), to 25 (=16’) is that *pismu* would be the term for ‘melodic pentad’, and that with regard *siḫip*, *siḫpum* would be a nominal derivative of *saḫapum*, ‘to throw to the ground’. However, for reasons that will become obvious during the process of our explanations, we would translate the verb *saḫapum* not as ‘to throw to the ground’, but ‘to sub-place’ the designated melodic pentad at the beginning of the next subset. As we explained before, an enneatonic subset is made up of two conjoined melodic pentads and we believe that lines 12 (= 3’), to 25 (=16’) give firstly the name of the second pentad of a subset, and secondly the instruction (*siḫip*) to replace it at the

beginning of the next subset where it is followed by a second pentad, thus creating a new subset, and so forth. Therefore these lines explain the formation of enneatonic subsets and confirm that each is made up of two conjoined melodic pentads.

Before explaining the process, let us be reminded of the structure of the sets:

Pentads *nīš tuḫrim* + *qablītum*	=	subset of *išartum*	= c-b-a-g-f-e-d-c-b
Pentads *qablītum* + *išartum*	=	subset of *qablītum*	= f-e-d-c-b-a-g-f-e
Pentads *išartum* + *kitmum*	=	subset of *nīš tuḫrim*	= b-a-g-f-e-d-c-b-a
Pentads *kitmum* +*embūbum*	=	subset of *nīd qablim*	= e-d-c-b-a-g-f-e-d
Pentads *embūbum* + *pītum*	=	subset of *pītum*	= a-g-f-e-d-c-b-a-g
Pentads *pītum* + *nīd qablim*	=	subset of *embūbum*	= d-c-b-a-g-f-e-d-c
Pentads *nīd qablim* + *nīš tuḫrim*	=	subset of *kitmum*	= g-f-e-d-c-b-a-g-f

and lines 3' to 16' of N 4782:

Line.12	*išartum*
Line.13	*siḫip išartim*
Line.14	*kitmum*
Line.15	*siḫip kitmim*
Line.16	*embūbum*
Line.17	*siḫip embūbim*
Line.18	*pitum*
Line.19	*siḫip pitim*
Line. 20	*nīd qablim*
Line. 21	*siḫip nīd qablim*
Line. 22	*nīš tuḫrim*
Line. 23	*siḫip nīš tuḫrim*
Line. 24	*qablītum*
Line. 25	*siḫip qablītim*

Explanation of the process from lines 3 to 16 of N 4782:

išartum (pentad)	f-e-d-c-**b-a-g-f-e**	(subset of *qablītum*)
siḫip išartim (move *išartum* to the front)	**b-a-g-f-e**-d-c-g-a	(subset of *nīš tuḫrim*)
kitmum (pentad)	b-a-g-f-**e-d-c-g-a**	(subset of *nīš tuḫrim*)
siḫip kitmim (move *kitmum* to the front)	**e-d-c-g-a**-g-f-e-d	(subset of *nīd qablim*)
embūbum (pentad)	e-d-c-g-**a-g-f-e-d**	(subset of *nīd qablim*)
siḫip embūbim (move *embūbum* to the front)	**a-g-f-e-d**-c-b-a-g	(subset of *pitum*)
pitum (pentad)	a-g-f-e-**d-c-b-a-g**	(subset of *pitum*)
siḫip pitim (move *pitum* to the front)	**d-c-b-a-g**-f-e-d-c	(subset of *embūbum*)
nīd qablim (pentad)	d-c-b-a-**g-f-e-d-c**	(subset of *embūbum*)
siḫip nīd qablim (move *nīd qablim* to the front)	**g-f-e-d-c**-b-a-g-f	(subset of *kitmum*)
nīš tuḫrim (pentad)	g-f-e-d-**c-b-a-g-f**	(subset of *kitmum*)
siḫip nīš tuḫrim (move *nīš tuḫrim* to the front)	**c-b-a-g-f**-e-d-c-b	(subset of *išartum*)
qablītum (pentad)	c-b-a-g-**f-e-d-c-b**	(subset of *išartum*)
siḫip qablītim (move *qablītum* to the front)	**f-e-d-c-b**-a-g-f-e	(subset of *qablītum*)

The table above demonstrates the indications in lines 3 to 16. The term *siḫip* unequivocally indicates the shift of the second pentad of a set to the position (in red above) of first pentad in the next set, and so forth. This further proves that the sets are made up of two conjoined pentads amounting to a bipentadic enneatonic set. It is also proposed that the term '*pismu*' means 'melodic pentad', to distinguish it from the enneatonic pitch set.

YBC 11381
(Enneatonism two thousand years later)

In 2010, Elizabeth E. Payne[1] published the latest cuneiform text with musical terms. It is Neo-Babylonian and is kept in the Yale Babylonian Collection. It is certainly one of the most significant additions to the corpus of music theory for the past fifty years. Our concern in this text rests with its musicology. We shall rely on Payne's transliteration and translation (figure 1).

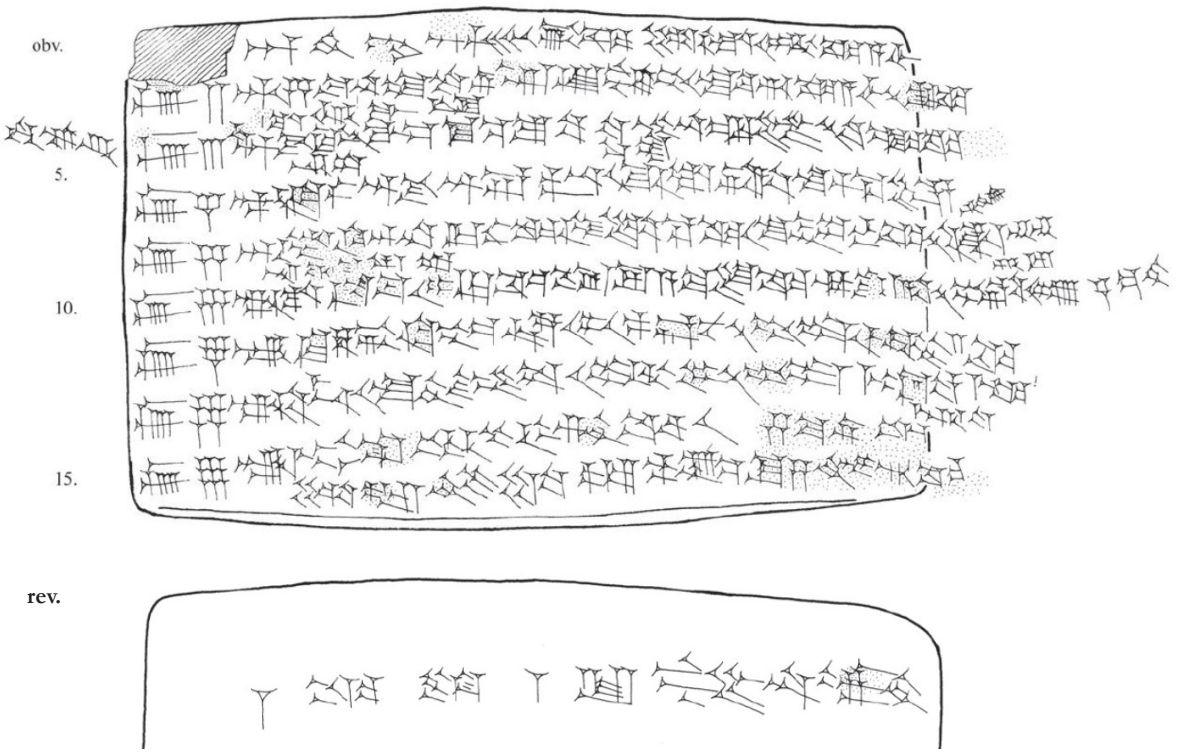


Figure 1. Payne's Hand copy of YBC 11381, rev. (5.8 x 8.9 x 2.5 cm)

1 Payne, E.E., 'A new Addition to the Musical Corpus' in *Opening the Tablet Box, Near Eastern Studies in Honor of Benjamin R. Foster*. Sarah C. Melville and Alice L. Slotsky, eds. *Culture and History of the Ancient Near East*. VOLUME 42, Brill, (Leiden, Boston, 2010), pp. 291-300.

Obv. [sa] ⌜⌉an.šár ⌜lugal dingir⌝ ^{meš}*be-lut-ka li-dam-mi-iq ka-a-ši*
⌜sa⌝ 2 ^{d} 15 *ba-na-at te-*⌜*né-šit*⌝ *ṭu-ub lib-bi u la-ba-ri ka-as-ši liš-*⌜*ruk*⌝*-ka*
sig *da-ar!-gal kak-ku*
sa 3 ^{d}dàra.gal ^{giš}tukul *ez-zu-tú* u_4*-mu na-al-bu-bu liš-tam-ḫir-ka* [(x)]
5 en du *qa-at*
sa 4 ^{d}en!⌜kī⌝. dù ^{d}gašan ^{d}lamma *pa-ti-qat dam-qá-a-tú la-mas-si bu-un-*(*ni*)
gi-ir
sa 5 ^{d}⌜dam.kī⌝.an.na *tés-lit-ka ṣu-le-e-ka u la-ban ap-pi-ka liš-tam-gir ana* en.en
en-⌜da-šū⌝*-ru-um* ri-ib
10 sa 6 ^{d}en.da.⌜šurim.ma *mī*⌝*-lik-ka nak-lu a-ma-tu-ka aq-*⌜*ra*⌝*-a-tú liš-taq-rib*
u_4*-mi-šam šá-am*
sa 7 ^{d}en.du$_6$.kù.ga ⌜*kī*⌝*-bi-is šul-mi u pa-*⌜*dan*⌝*-nu liš-tak-kan ana ši-*⌜*kin*⌝*gir*^{ll}*-ka* ME
sa 8 ^{d}en.u$_4$.ti.la *ḫi-ṣib ṭuḫ-du u* ḫé.gál-lu$_4$ *liš-tak-kan ana me-* ⌜*rit*⌝ *érin*^{me}*-ka* !
me-ri-tú
15 sa 9 ^{d}en.me.šàr.⌜ra⌝*il-lat rag-*⌜*gī*⌝*-ka u* ⌜*za-ma-ni-ka*⌝
li-šab-bir li-sap-pi-iḫ ^{giš}⌜tukul *za-'-i-ri*⌝*-ka*

rev. *ana* ka sar *ana ṭu-ub-bi na-*⌜*as*⌝*-ḫi*
le.e. *šal-šú uḫ-ri*

String 1 may **Aššur**, the king of the gods, improve your dominion for you.
String 2 may **Ištar**, who created mankind, grant you well-being and longevity.
String 3 may **Daragal** make you rival the fierce weapon(s and) the raging storm.
String 4 may **Enkidu**, treat kindly the Lady, the protective spirit who created good things, the lamassu.
String 5 may **Damkianna** make your appeal, your prayers, and the stroke of your nose always pleasing to the lord of lords.
String 6 may **Endašurimma** present your artful advice and your precious words daily.
String 7 may **Endukuga** always let your footstep fall on a prosperous road and a smooth path. (Gloss)
String 8 may **Enudtila** constantly establish abundance, plenty, and prosperity for the pastures of your people.
String 9 may **Enmešarra** crush the forces of those who wrong you and of your enemies. May he scatter the weapons of your adversaries.

Copied according to dictation; excerpted for (my) well-being. (left edge) The third (string) from the end.

We take it that each incipit, for example: '*the king of the gods, improve your dominion for you.*', with its beseeched god: '*May Aššur,*', might indicate either that the incipit was sung in the subset of string 1, or indicated a specific melody sung in the 'tonality' of the first string subset. Therefore, there must be a relationship between, a) the incipit and the dedicatee god, and b), the musical nature of the subset.

The incipit of the second string and its dedicatee goddess, Ishtar: '*May Ištar, who created mankind, grant you well-being and longevity.*', is in our view closest to the subset of *išartum*, which is also the first subset listed in the right column of U. 7/80. It is more difficult to associate other incipits with specific subsets. However, it would appear logical that the author(s) of the present text would have followed the order of the subsets given in U. 7/80.

This text introduces a ninth subset which should be placed in first position as given next page.

sa 1 May Aššur, the king of the gods, improve your dominion for you.
c-b♭-a-g-f-e♭-d-c-b♭

sa 2 May Ištar, who created mankind, grant you well-being and longevity.
c-b-a-g-f-e-d-c-b

sa 3 May Daragal make you rival the fierce weapon(s) and the raging storm.
c-b-a-g-f♯-e-d-c-b

sa 4 Enkidu, treat kindly the Lady, the protective spirit who created good things, the lamassu.
c♯-b-a-g-f♯-e-d-c♯-b

sa 5 May Damkianna make your appeal, your prayers, and the stroke of your nose always pleasing to the lord of lords.
c♯-b-a-g♯-f♯-e-d-c♯-b

sa 6 May Endašurimma present your artful advice and your precious words daily.
c♯-b-a-g♯-f♯-e-d♯-c♯-b

sa 7 May Endukuga always let your footstep fall on a prosperous road and a smooth path.
c♯-b-a♯-g♯-f♯-e-d♯-c♯-b

sa 8 May Enudtila constantly establish abundance, plenty, and prosperity for the pastures of your people.
c♯-b-a♯-g♯-f♯-e♯-d♯-c♯-b

sa 9 May Enmešarra crush the forces of those who wrong you and of your enemies. May he scatter the weapons of your adversaries.
c♯-b♯-a♯-g♯-f♯-e♯-d♯-c♯-b♯

A two thousand years-old enneatonic tradition was still well engraved in the minds of musicians and of the composers of melodies, as this text attests. We note that the fourth string, 'Ea-the-creator' in Nabnitu xxxii is still known here as '**sa** 4 - Enkidu...'.

The text leaves an unexplained reverse: *ana* ka sar *ana ṭu-ub-bi na-*⌜*as*⌝*-ḫi*
le.e. *šal-šú uḫ-ri*

CBS 1766
First evidence of heptatonism
(Construction and underlying transition between enneatonic linear pitch dispersion and cyclical heptatonic pitch dispersion)

Figure 1. CBS1766, courtesy of the University Museum of Philadelphia, Pennsylvania.

This text is kept in the collections of the University Museum, Philadelphia, Pennsylvania. It was first published by Hilprecht over one hundred years ago in his *Explorations in Bible Lands During the 19th Century*[1]. The volume includes a photograph with a caption describing the manuscript as an 'Astronomical Tablet from the Temple Library'.

Caroline Waerzeggers and Ronny Siebes[2] from the Vrije Universiteit in Amsterdam offered a reliable reading of most of the text, especially with regard the nomenclature on the heptagon, which they identified as musical terms.

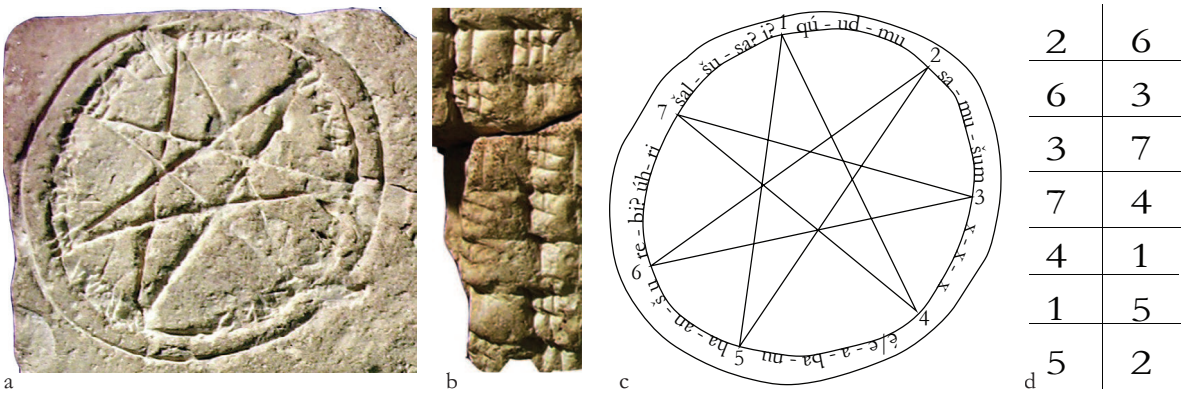
The tablet is divided into two sections. The first section, (fig. 2) at the top left consists of a heptagram inscribed within two concentric circles with script written on the inner side of the circles.

The second section, below the heptagram, is a table with 11 columns the first of which empty, with traces of script. Columns two and three are inscribed with two lists of seven numbers each

1 Hilprecht, H. V. (Hermann Vollrat), 1859-1925; Benzinger, I. (Immanuel), 1865-1935; Hommel, Fritz, 1854-1936; Jensen, Peter Christian Albrecht, 1861-1936; Steindorff, Georg, 1861-1951. *Explorations in Bible lands during the 19th century*. (1903).

2 *N.A.B.U.*, (2007), no. 2 (juin), pp. 43-5.

(possibly eight). These columns are essential to the principal meaning of the text. A header spreads along the whole length of the columns. Some propositions have been put forward regarding its interpretation but none up to now is sufficiently intelligible. Column 11 has traces of terms which remain obscure.



2	6
6	3
3	7
7	4
4	1
1	5
5	2

Figure 2, a, b, c and d. a) detail of the heptagram in the tablet; b) detail of the columns with the numbers related to the heptagram; c) line copy of the heptagram and transliteration; d) transcription of the numbers in the columns related to the heptagram.

The nomenclature on the heptagram and the readings of the first two columns to the left of the table are clear, as shown in figure 2, c.

The numbers in the columns express an alternation of descending fifths and ascending fourths. If '1' is 'C', then '2-6' = 'B-E'; then '6-3' = 'E-A'; '3-7'= 'A-D'; '7-4'= 'D-G'; '4-1' ='G-C'; '1-5'= 'C-F' and '5-2'= 'F-B'.

To a musicologist, this pattern suggests immediately a typical method of tuning, still in usage to this day, for the construction of a heptatonic scale by means of descending fifths and ascending fourths. The reason we have chosen to start the pattern with descending fifth 'B-E' followed by ascending fourth 'E-A', etc., is that the last alternation will fall on a tritone, avoiding any sharps or flats, for the sake of clarity. The heptagram associates the points of the star with the names of the strings from one to seven. It is to be noted that although the strings have been reduced to seven out of nine, as with most other texts, the remaining seven have kept the older nomenclature, i.e., 'front (string)'; 'neighbouring (string)'; 'third thin (string)' 'Ea-the-creator'; 'fourth-behind' and 'third-behind'. It makes no doubt that while the heptagram was a systemic revolution, it nevertheless kept elements of the older style. They could have named the strings first-string; second string; third string; fourth string; fifths string and seventh string, following the order of the numbers.

Unfortunately, this text is incomplete. However, its readable parts are sufficiently explicit to prove heptatonism, its construction and the first evidence of cyclical pitch dispersion. The columns could be reconstructed. However, their content does not appear to give anything particular other than natural properties of the heptachord. We could assume that the header simply explained the figures in the columns, in which case, its importance would not be of great consequence. However, this is speculative.

More importantly is the reason why the heptagram is drawn so carelessly? While it is agreed that a heptagram cannot be drawn *exactly* with ordinary drawing tools, we must agree that the scribe could have done better. Then, an inspired amateur offered a most interesting remark without really understanding its importance. She assumed that the irregularity was intentional because it was the first ever attempt at representing semitonal values, *graphically*. Indeed, a regular heptagon falsely expresses heptatonism since the points of the star are equidistant. A closer look at the design explains her position.

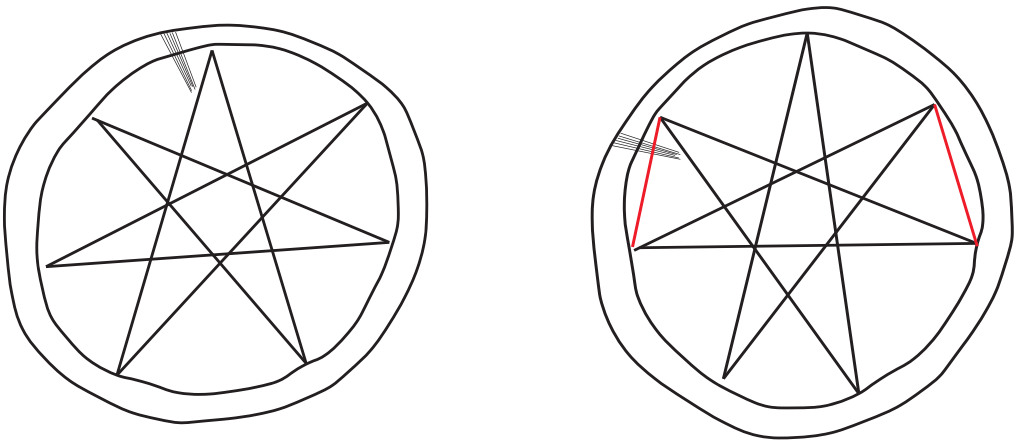


Figure 3. Left, heptagram as it is orientated in the original text. Right, heptagram rotated to locate semitones in symmetry, at both sides, delineated with red lines.

Figure 3, left, shows the heptagram in its original position in relation to the tablet. Figure 3, to the right, shows the heptagram rotated counterclockwise by about 40 degrees. Immediately the answer appears: The red lines locate the semitones in the heptatonic representation. There, they are placed *symmetrically* in relation to the vertical point 2, which in our hypothesis is pitch B which starts the sequence of alternation of descending fifth and ascending fourths, as given in the columns in figure 2, b and d.

The striations to the left of point 1 appear to emphasize the location of c.

Additionally to giving instructions for the construction of a heptatonic set, the figure was probably used as a device (build from two round plates of metal rotating, on top of one another) which located tones and semitones in each of its seven subsets. For example, in the subset of *qudmû*, the semitones are located between the first and second strings and the fifth and sixth strings; in the subset of *šamušum*, the semitones are between fifth and sixth strings and first and second strings, and so forth.

As soon as Babylonian scholars estimated the semitone as half a tone, it would have become far easier for them, conceptually, to divide the 360 degrees of the circle into 12 sections of 30 degrees since the theory approximately divided the octave into six tones, or twelve semitones[3].

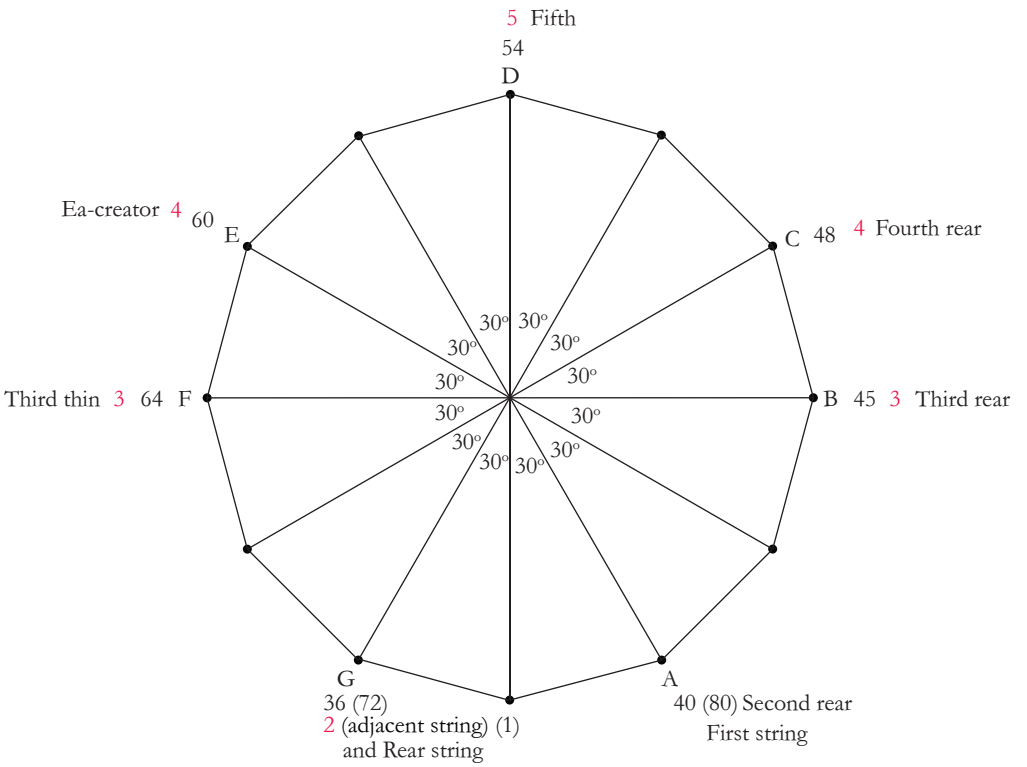


Figure 4. Dodecagram placing the bipentadic-enneachord in red numbers; Nippur quantification of 30 degrees per semitone and 60 per tone.

While Babylonian scholarship might have divided the circle into twelve angles of 30 degrees to quantify semitones; two semitones of 60 degrees for tones, and consequently would have invented the equal temperament system is far-fetched. In case they did actually invent the equal temperament, they could not have applied it as it rests on the slight reduction of fifths and slight expansion of fourths with thirds increasing their numbers of interferential beats as they progress to the treble. Firstly this method would have been beyond their reach and secondly they would have had no purpose for it as equal temperament is useful only with the concept of Western harmony.

Among other hypothetical inventions was their calculation of frequency. However, this was only in the form of reciprocals of strings lengths and in ignorance of what frequency was; they invented chromaticism but only as a consequence of the metabolisation of the dynamic to the

3 However, six just tones are larger than an octave as 6 x 9/8 = 531441/262144 which is 1223.46 cents, or 23.5 cents larger than the octave. So the division of the 360 degrees of the circle into 12 parts of 30 degrees each, was only applicable for music theory not until Napier's invention of logarithms which led to Juan Caramuel y Lobkowitz's contribution to the equal temperament, in the mid-seventeenth century. This was possibly the source for Aristoxenos' early discussions on this matter in the fourth century BCE. (Fig. 4)

thetic, but which they never used it as Western Musicology understands it; they came up with heptatonism in the late first millennium but only as a subsystem of enneatonism.

The irregular seven-pointed star also changed the morphology of the heptatonic set. Bipentadic-enneatonism consisted in the conjoining of two melodic fifths while the heptatonic set consisted of two conjoined harmonic fourths.

In order to understand the metabolisation of the bi-pentadic set, or enneatonic set to the bi-tetradic or heptatonic set, or the metabolisation from linear to cyclical pitch dispersion, just imagine that the series in *nabnītu* xxxii, 1-2-3-4-5-4-3-2-1 is a series of pitches marked by knots on a string (figure 5):

Figure 5. Enneatonic generative set in a linear pitch dispersion with 'D' as axis of symmetry. Tones and semitones are labelled '1' and '1/2' respecticely.

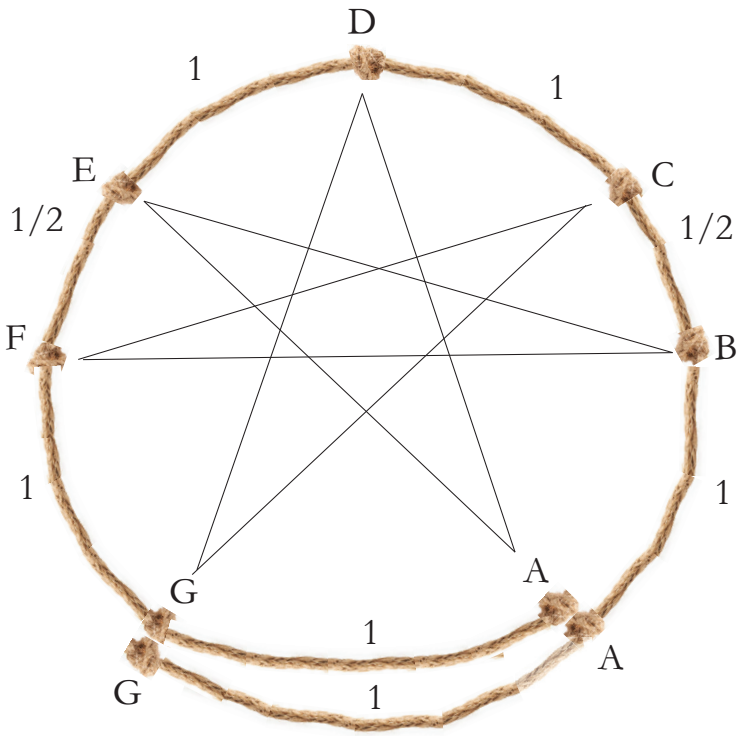


Figure 6. The 'enneatonic' rope is rolled over the heptagram. note the doubling of 'As' and 'Gs' resulting in the change from enneatonic to heptatonic systems. This explains the metabolisation from linear to cyclical pitch dispersion.

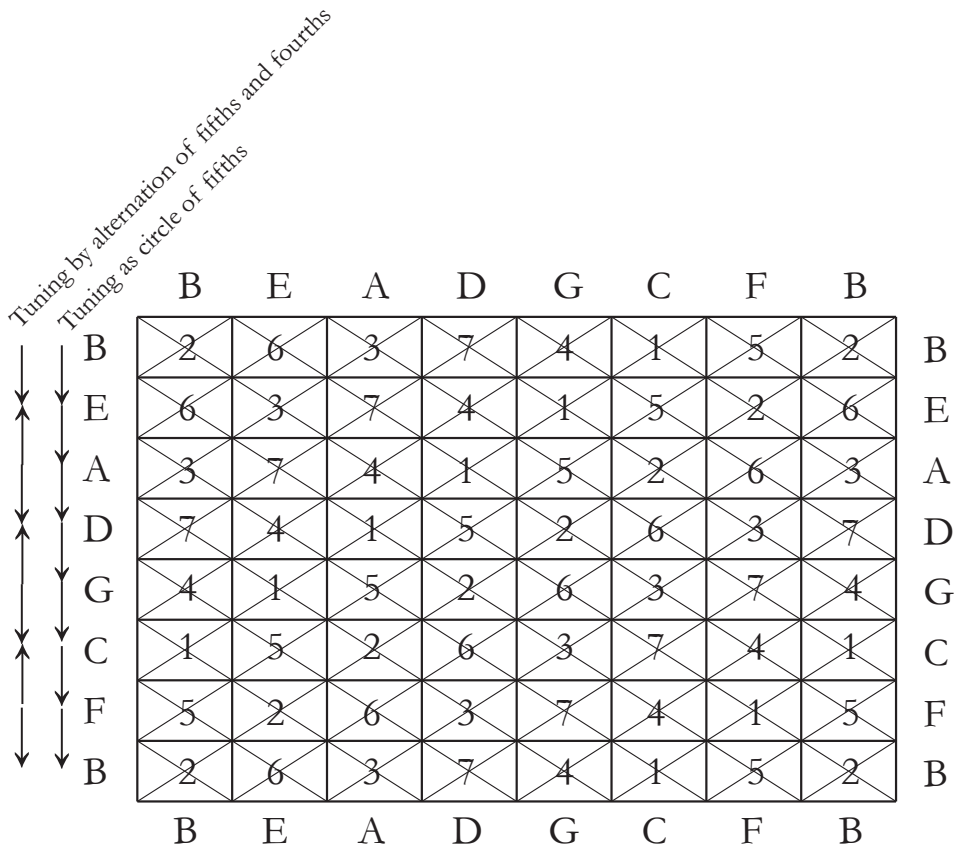

Tuning by alternation of fifths and fourths
Tuning as circle of fifths
B E A D G C F B
B 2 6 3 7 4 1 5 2 B
E 6 3 7 4 1 5 2 6 E
A 3 7 4 1 5 2 6 3 A
D 7 4 1 5 2 6 3 7 D
G 4 1 5 2 6 3 7 4 G
C 1 5 2 6 3 7 4 1 C
F 5 2 6 3 7 4 1 5 F
B 2 6 3 7 4 1 5 2 B
B E A D G C F B

Figure 7. Reconstruction of the numbers in the tables of the texts.

H6 = (RŠ13.30 + 15.49 + 17.387)

Introduction

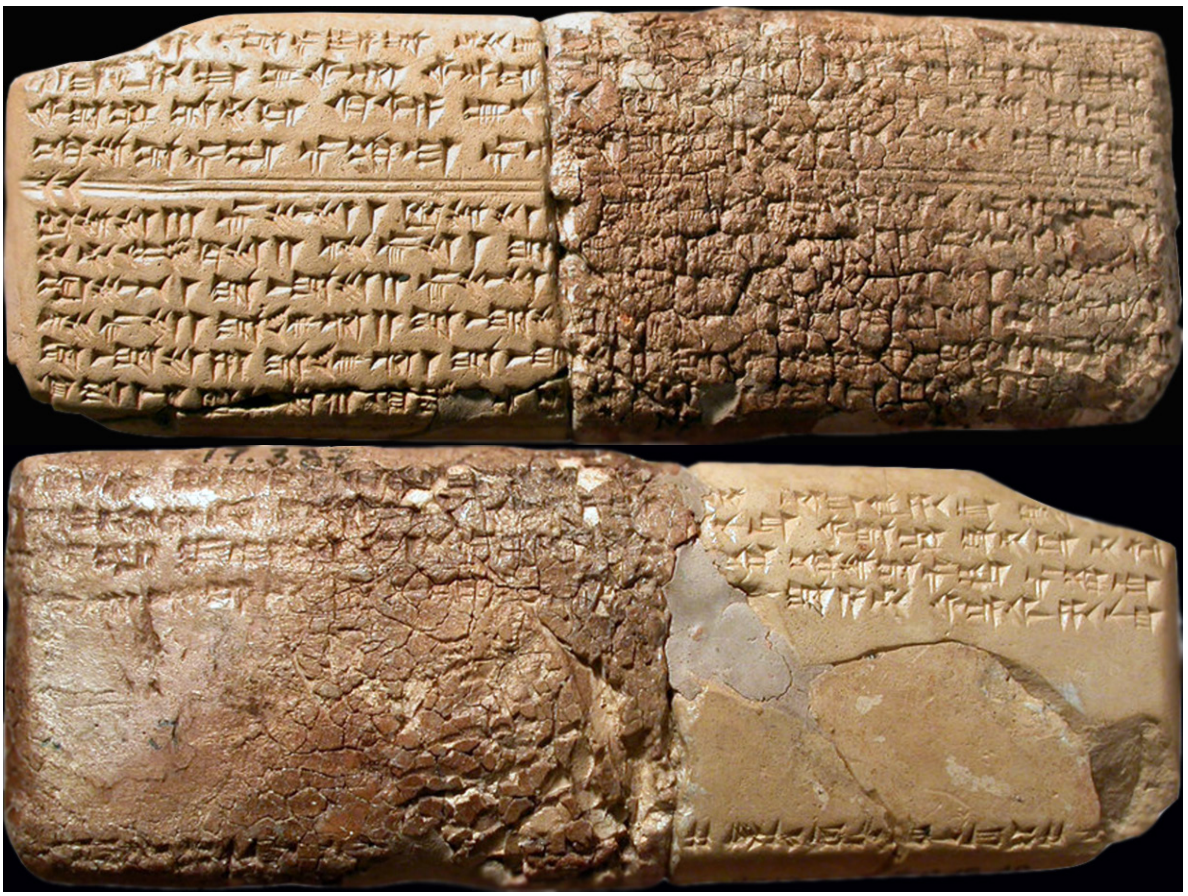


Figure 1. Tablet H6 = (RŠ13.30 + 15.49 + 17.387), Obverse and Reverse. This tablet is hosted at the National Museum of Damascus.

Tablet H6 is part of a collection of about twenty-nine fragmentary cuneiform tablets unearthed during the pre and post war Missions at Ras Shamra, Syria, conducted by the French scholar Claude Schaeffer[1]. The tablets are written in Hurrian[2], an agglutinative language, with Babylonian signs (fig. 1). The scribes who wrote these texts were Babylonians as their name and usage of Hurrianised Babylonian suggests. The tablets would all have had the same rectangular shape. The writing is parallel to the longest side and is divided in three parts. The first varies with each tablet, but generally the text continues onto the obverse. The text usually consists of one

1 Nougayrol, J.; Boyer, G.; Laroche, E., Le Palais Royal d'Ugarit III et Planches, in *Mission de Ras Shamra*, Tome IV. Schaeffer, C. F-A (ed.) (Paris, 1955); Courtois, J-C.; Contenson, H., de; Kusche, A.; Vallois, H-V.; Ferembach, D; Dastugue, J.; Charles, R.; Clairmont, Ch.; Miles, G. C., *UGARITICA* IV, C. F-A Schaeffer, (ed.) (Paris, 1962); Nougayrol, J.; Laroche, E.; Virolleau, Ch.; Schaeffer, C. F-A. *UGARITICA* V, C. F-A Schaeffer, (ed.) (Paris, 1968)

2 Hurrian is an ergative agglutinative language which with Urartian, constitutes the Hurro-Urartian family. The Hurrians migrated to northern Mesopotamia around 2300 BC and had mostly vanished by 1000 BC. It was the language of the kingdom of Mitanni, in northern Mesopotamia, and was likely to be spoken at least initially in Hurrian settlements in Syria and notably Ugarit. It is generally believed that the speakers of this language originally came from the Armenian mountains and spread over southeast Anatolia and northern Mesopotamia at the beginning of the 2nd millennium BC.

paragraph which ends with a double line on which sits a double winkelhaken, at the beginning and at the end, on the obverse.

The second part spreads below the double line, with Hurrianised Babylonian musical terms which are followed, in most cases, by a number. Terms sometimes have pre or post-positioned adjectives. The first part gives the verse, the second music and rhythm. The third part is the colophon written at the bottom edge of the tablet. Typically, its says that it is ' . . . a song in the pitch set of 'x', followed by an adjective and deities to whom the song is devoted. Follows the name of a scribe. Two of them are mentioned in the texts. There is a certain Ammurabi, another, *Ipšali*, and four Hurrian composers: *Tapšiḫun*, *Puḫiyanna*, *Urḫiya* and *Ammiya*. This is to our knowledge the first instance when composers are named, in world music history. Regrettably, H6 is the only tablet which came reasonably intact to us, reconstructed from three fragments: (RŠ13.30 + 15.49 + 17.387).

The colophon of tablet H6 is unequivocal:

It reads:[*an-nu*]-*ú za-am-ma-rum ša ni-id-kib-li za-l*[*u*]-*z*[*i ša* **DINGIR.MEŠ TA** ^{m}*Urḫiya*] *šu am-mu-ra-bi*, which translates as: '*This is a song* in the scale of *nidqibli* a *zaluzi* for the gods, written by *Urḫiya* and composed by *Ammurabi*'. *It is a song*, unequivocally. There are no indications of any instrumental accompaniment. Furthermore, an instrumental accompaniment to this song/ prayer, as far as we understand it, would be incongruous with the private nature of this young woman's prayer asking goddess Nikkal to make her fertile.

We shall only discuss music notation. Our knowledge of Hurrian is still limited and therefore the vocalisation of the language remains uncertain, especially that it is written with Babylonian signs not ideally suited and therefore cannot provide with meaningful metric values.

The colophon says that the song is in the pitch set of *nid kibli*. The nature of this set has been elucidated from three texts: CBS 10996, *nabnitu* xxxii, and UET VII, 74, already discussed. *ni-id-kib-li* (Hurrian), *nīd qablim* (Babylonian) is a bipentadic-enneatonic descending pitch set: e-d-c-b-a-g-f-e-d. The values for melodic triads and pentads are known from the transposition of the string numbers to the enneatonic set of *nīd qablim*. This is a straight forward operation. The music part of the tablet is composed of the names of melodic triads and pentads and of numbers following each of them:

Line 5. [*qablite* 3] [*irbute* 1] [*qablite* 3] [*šaḫri* 1] [*titimišarte* 10] *uštamari*.....?

Line 6. [*titimišarte* 2] [*zirte* 1] [*šaḫri* 2] [*šaššate* 2] [*irbute* 3] [*šaššate* 2]

Line 7. [*umbube* 1] [*šaššate* 2] [*irbute* 2] [*nadqabli* 1] [*titur qablite* 1] [*titimišarte* 2]

Line 8. [*zirte* 1] [*šaḫri* 2] [*šaššate* 4] [*irbute* 1] [*nadqabli* 1] [*šaḫri* 2]

Line 9. [*šaššate* 2] [*šaḫri* 1] [*šaššate* 2] [*šaḫri* 1] [*šaššate* 2] [*irbute* 4]

Line 10. [*kitme* 2] [*qablite* 3] [*kitme* 1] [*qablite* 2] [*kitme* 1] [*qablite* 3]

Some numeric values could not be clearly read because of the damage to the tablet.

The melodic value for the melodic triads and pentads in H6 is:

umbube = c-b-a-g-f; *nadqabli* = b-a-g-f-e; *qablite* = a-g-f-e-d; *kitme* = g-f-e-d-c; *titur qablite* = b-c-d; *titimisarte* = a-b-c; *zirte* = g-a-b; *šaḫri* = f-g-a; *šaššate* = e-f-g; *irbute* = d-e-f

With regard metrics, each melodic pentad has five pitch units and each melodic triad has three. Remains to determine the length value of the numbers which follow. We take it that Hurrian composers would not have devised some obscure and complex method with which to express rhythm, after all, music indications are there to enlighten and not to obscure. We also assume, in the present interpretation, that the pitches of melodic triads and pentads were all equal. Our contention is that the last member of an interval was prolonged by a quantity defined by the number which follows. The only reasonable quantity would be:

𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯1= 𝅘𝅥𝅯𝅘𝅥𝅯 𝅘𝅥 ; 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯2 = 𝅘𝅥𝅯𝅘𝅥𝅯𝅗𝅥 ; 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯3 = 𝅘𝅥𝅯𝅘𝅥𝅯𝅗𝅥. 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯4 = 𝅘𝅥𝅯𝅘𝅥𝅯𝅝,
𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯 1 = 6; 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯 2 = 8; 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯 3 = 10; 𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯𝅘𝅥𝅯 4 = 12, etc.

When this method is applied to the intervals, and taking in consideration the damage of the tablet, lines 6 to 9 would have 36 beats each. Lines 6 and 10 would vary, as line 6 is introductory and line 10 jumps into line 6 as a catchline for the repeat indicated both by the double winkelhaken and the lyrics. This regularity in the metrics of the piece further proves that the triads and pentads were melodic and not harmonic.

Line 5. [*qablite* 3] = 10 [*irbute* 1] = 4 [*qablite* 3] = 10 [*šaḫri* 1] = 4 [*titimišarte* 10] = 22 + [*uštamari*..... ?	= 50+
Line 6. [*titimišarte* 2] = 6 [*zirte* 1] 4 [*šaḫri* 2] = 6 [*šaššate* 2] = 6 [*irbute* 3] = 8 [*šaššate* 2] = 6	= 36
Line 7. [*umbube* 1] = 6 [*šaššate* 2] = 6 [*irbute* 2] = 6 [*nadqabli* 1] = 6 [*titur qablite* 1] = 4 [*titimišarte* 2] = 6	= 34?
Line 8. [*zirte* 1] = 4 [*šaḫri* 2] = 6 [*šaššate* 4] = 10 [*irbute* 1] = 4 [*nadqabli* 1] = 6 [*šaḫri* 2] = 6	= 36
Line 9. [*šaššate* 2] = 6 [*šaḫri* 1] = 4 [*šaššate* 2] = 6 [*šaḫri* 1] = 4 [*šaššate* 2] = 6 [*irbute* 4] = 10	= 36
Line 10. [*kitme* 2] = 8 [*qablite* 3] = 10 [*kitme* 1] = 6 [*qablite* 2] = 8 [*kitme* 1] = 6 [*qablite* 3] = 10	= 48?

Note that Line 5 could equal 72 on account of the unknown *uštamari* value; Line 7 could have misread a value and be 36; Line 10 could be 36 since the last interval [*qablite* 3] = 10 is a catchline for line 5.

In the Spring of 2011, in Damascus, at the Dar al-Assad Opera House, we presented our version of H6 with some emotion, as the original tablet was resting only a few hundred metres away. I was quite anxious about reactions from Maqam masters present. To the contrary, some started to hum as if they had known the music from some distant memory, firmly anchored in their unconscious. Later, we engaged in enthusiastic discussions and the terms *bayati* and *Hijazi* recurred. These musicians naturally felt the need to emphasize certain pitches in the subsets. Then, it became obvious that there is a direct link between Babylonian music theory, Hurrian songs and the Oriental Maqam.

Figure 27. The author's tonal interpretation of H6.

The score above is a tonal transcription of the text. It is impossible at present to tell how the modal interpretation of the music went.